



"I reflect a fact
you can't deny,
**NEW ENGLAND
CHICKS**
are the kind
to buy."

TIMELY TOPICS

SEVENTH EDITION

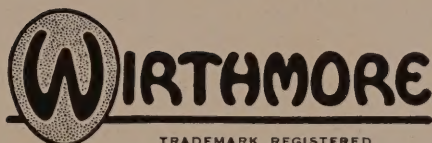
ON POULTRY MANAGEMENT

WIRTHMORE
POULTRY SERVICE DEPT.

TIMELY TOPICS

Seventh Edition

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Edited by



Poultry Service Department

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CHAS. M. COX CO.
Boston, Mass.

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A brief summary of the contents of this book will be found on
pages 205, 206 and 207

Your comments concerning this book, whether favorable or otherwise, would be extremely helpful to us and gratefully received. Every effort has been made to have the subject matter authentic and up-to-date at time of publication.

**WIRTHMORE FEEDS
MALDEN, MASS.**

Printed in U. S. A. by Warren Press, Boston, Mass.

FOREWORD

Through the years, "Timely Topics" has developed into more than "just another poultry book"—it has become a New England "institution", recognized as an authoritative reference on poultry management and used as such by thousands of New England poultrymen.

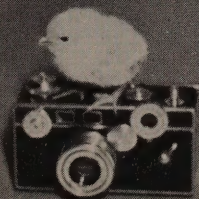
"Timely Topics" comes to you with the compliments of the manufacturers and distributors of Wirthmore Feeds—with the hope that it will be of some practical assistance to you and prove of the same high standard as Wirthmore Feeds themselves.



The BABY CHICK

EVERYONE, particularly a chicken man, admires bright-eyed, fluffy, active day-old chicks. To the real poultryman they represent the start of an investment from which he hopes and expects to make a profit during the year to come. In addition, chickens can and should be a source of pleasure and satisfaction to those whose job it is to care for them.

The baby chick is a complex being—an ounce and a half of marvelous mechanism. Underneath the down are many things which cannot be seen by the naked eye. Genes and chromosomes are minute particles. Combinations of these tiny particles determine the occurrence of broodiness, the date of maturity, size of the egg, color and texture of the shell, and many other important factors. In short, breeding largely governs the future performance in the laying house of the pullets from any flock



MANAGEMENT—FEEDING



Bright-eyed alertness.

of baby chicks. Together with proper feeding and management of the parent stock, breeding determines whether or not the day-old chick is to start out in life with healthy, properly functioning internal organs.

Why Buy New England Chicks?

Poultrymen can scarcely give too much thought and consideration to selection of the source from which they plan to purchase their baby chicks.

More than 50% of the eggs produced in New England are shipped either as hatching eggs or baby chicks to points outside the New England area. Every section of the United States, and many foreign countries, purchase these New England quality "products". Truly, New England has built up an enviable reputation for quality stock. Poultrymen who live in New England are fortunate—good sources of day-old chicks are easily available.

With these facts in mind it seems unnecessary for New England poultrymen to go outside of New England to purchase their replacement chicks. Price, of course, is a factor, but the price paid for a day-old chick represents, on the average, only 10% of the total cost of that chick when mature and ready to lay. Thus it is sound business judgment for the

poultryman to avoid the temptation of allowing a saving in initial cost of a few cents per chick to be too great a factor in deciding to whom he will give his order.

Freedom from pullorum disease and freedom from certain undesirable tendencies are some of the reasons why New England-bred chicks have worked their way to the head of the list. Another highly important reason why New England poultrymen should confine their purchases of day-old chicks to New England is that it is practical to visit the seller, look over his plant, inspect the flock and actually see the conditions under which the parent stock is kept. In this way, some idea can be gained as to the results that are being secured in the way of general health, egg production, egg size, etc. Other farms where this same stock has been purchased can also be visited and notes made of the results obtained.

Most New England breeders have three general grades of chicks to offer:

1. Flock matings.
2. Special matings.
3. Pedigreed matings.

Flock matings represent the general flock and are satisfactory for the man who is not a breeder but is looking only for replacement layers.

Special matings and pedigreed matings represent the kind of chicks that should be purchased for foundation stock and for flock improvement.

Special matings are those such as selected old hen and old cock matings used by a breeder to replace his own flock. Many poultrymen find that the type of chick resulting from this mating, although more expensive to purchase, proves a good investment as a source of replacement layers.

Pedigreed matings represent individual matings of trapnested birds with known ancestry. Chicks from such matings are usually banded.

Number of Chickens to Brood Per Unit

Regardless of the size or shape of the brooding quarters and regardless of the kind of brooding equipment used, not over 300 chicks should be placed together in one unit. During the past few years many successful poultrymen have reduced this maximum to 250. As a result they are having far less culls and are able to put practically as many pullets into the laying quarters as was the case when 50 more chicks were brooded in each unit.

The best chicks, the best feed, the best houses, and the best management in the world can be easily defeated by overcrowding. Although a natural attempt to make more money, overcrowding usually results in heavy loss of chickens and a consequent drop in profits.

What Breed to Select

New England breeders recognize the value of a dual-purpose breed. Many strains of the American breeds such as Rhode Island Reds, New Hampshires, White Plymouth Rocks, and Barred Plymouth Rocks have been bred to lay large quantities of big, brown eggs and still retain their good meat qualities.

The value of crossing pure breeds in order to obtain desirable economic features has also been recognized by New England breeders.

Those areas in New England catering to the New York market use large quantities of White Leghorns. These birds lay white eggs.

Cross-Bred Chicks

It should be kept in mind that the parent stock used in cross breeding is equally as important in determining the future performance of the resultant chicks as it is in the case of straight breeding.

Sex-linked crosses are the mating of two breeds, resulting in differences in appearance of the offspring. These differences in appearance identify the sex. The value of sex-linking is that sex of chicks can be determined at hatching time. A common example of a sex-linked cross is the mating of Rhode Island Red or New Hampshire males with Barred Plymouth Rock females.

At hatching time, the sex of the chicks from this cross can be determined by the down and shank color. The cockerel chick is black, with a pronounced white spot on the top of its head. Its shanks are yellow. The down of the pullet chick is usually entirely black or, if not, carries only an insignificant white spot. The pullet chick also has dark shanks. As the chicks feather, the cockerels are barred; the pullets are black and may have golden neck feathers. The economic advantage of the sex-linked cross is the opportunity to purchase or sell either sex separately.

When crossing Barred Plymouth Rock males on Rhode Island Red or New Hampshire females, the chicks are not sex-linked. They all carry the characteristics of the male and look very similar to straight Barred Plymouth Rock chicks. This cross is used largely in producing broiler chicks which have been in great demand in the big broiler-producing country known as the "Del-Mar-Va Peninsula" which lies in the states of Delaware, Maryland and Virginia.

Economical meat production and specialized egg production have been the factors back of the development of cross-bred chicks. Hybrid vigor is an advantage gained from crossing breeds. In order to be assured of satisfactory egg production, it is essential that the breeds and strains crossed be proved from this standpoint.

Sexed Chicks

In New England a demand has developed for all-pullet chicks from straight-bred parents.

The art of sexing to separate cockerels from pullets has been perfected and there are now numerous experienced, thoroughly qualified persons available to do this work. Sexing must be done at the time the chicks are taken from the incubator, or within 24 hours from the time they actually come out of the shell.

The procedure of sexing day-old chicks in no way harms them if done by an experienced and capable operator. Most chick sexers guarantee



An experienced chick sexer at work.

accuracy within 10%. This means that when a poultryman buys day-old pullet chickens he can expect to get better than 90% accuracy.

On poultry plants where brooder house capacity is limited, and where range capacity is also very much limited, poultrymen have been well pleased with their decision to purchase only sexed pullet chickens.

Pullet chicks cost more than straight-run chicks and represent more of an investment. The breeder poultryman must charge for the cost of sexing and for the loss in selling cockerel chicks at a relatively low price.

Poultrymen should plan to put fewer all-pullet chicks in a brooder unit than has been their practice with straight-run chicks in the past.

The general practice in the past, of course, has been to separate cockerels from the pullets at around six weeks and put them elsewhere. All-pullet chicks should be separated into smaller units at six weeks of age. Otherwise the poultryman should plan to brood not over 200 all-pullet chicks together in one brooder unit.

When to Buy Chicks

It is possible in New England to buy day-old chicks during any week or month of the entire year. It is impossible to give intelligent advice as



to when to buy day-old chicks unless one is fully acquainted with the kind of business being conducted on the individual poultry plant. It may be helpful to give a little information as to the way chicks that are hatched at different seasons of the year can be expected to perform. Chicks hatched from the same flock of breeders grow and

develop quite differently, depending upon the hatching date.

The following schedule will give some idea of what is meant by “early hatched”, “normally hatched”, “summer-hatched”, and “fall-hatched” chicks.

Early hatched	December 1—February 15
Normally hatched	February 15—April 15
Late-hatched	April 15—June 15
Summer-hatched	June 15—August 15
Fall-hatched	August 15—December 1

Early hatched chicks probably grow the fastest and mature the earliest. Their body weight is apt to be somewhat less than that of normally hatched or later-hatched chicks and their egg size will be smaller for a longer period of time. They will never produce as high a percentage of large eggs as will chicks hatched during or after the normal hatching period.

Chicks hatched during the normal period will probably weigh one-half to one pound more at maturity than do early hatched chicks and egg size will be normal for the strain.

Late-hatched chicks will be about one month longer in reaching maturity than are early and normally hatched chicks but will produce large-sized eggs much sooner after coming into production.

Chicks hatched during the summer months are smaller in size at maturity and take longer to mature than do chicks hatched during the normal season.

Fall-hatched chicks usually grow to a normal, average size and come into production at about the same time as early hatched chicks, depending, of course, upon whether they are range-reared or reared in confinement. Their egg size is small and seldom reaches normal for the strain.



Colony brooder houses filled with November-hatched chicks.

Due to changing weather conditions to which New England is subject, poultrymen should realize that the different hatching periods involve different brooding problems. As a rule, early hatched chickens cannot be put on the ground or under range conditions until the last of March when their average age will be close to three months. This means that they will require more brooder house space than do chicks hatched during the normal season. The latter can, as a rule be put on range when seven to nine weeks of age. Furthermore, after chicks that are hatched in the normal season reach the age of two to four weeks, they can spend more time on the ground around the brooder houses when runs are available. This helps to relieve congestion in the brooder houses.

Summer-hatched chickens can go out on suitable runs around the brooder units after the first few days.

Late fall-hatched chickens are raised principally in confinement. It is highly desirable to get them out on the ground during pleasant fall days to harden them off and to help in weaning them from the heat. When purchasing fall-hatched chicks, the poultryman must take into consid-



November-hatched pullets in bagged range shelters. They were put on range during the first week of March.

eration the necessity of providing ample brooding and growing quarters, especially if the birds are to be kept to maturity.

Brooding Quarters

Brooding units should be located as far away from the laying quarters as is practical. This helps to cut down the spread of disease organisms from the laying stock to the young birds. There is a growing tendency toward small brooding units, well spread out, to lessen the contamination encountered when larger units are used. Many poultrymen feel that the small units tend to improve the quality of the stock raised. Their use makes it feasible to brood several lots of chickens of different ages at the same time. The successful use of large, continuous brooding systems invariably requires that only chicks of the same age be reared at one time. The extra labor involved in the use of small units seems to be offset by improved quality of the stock raised and by greater freedom from chick troubles.

An excellent brooding arrangement is to use starting batteries, preferably of the contact heat type, for not over two weeks and to then remove the chicks to small colony brooding units.

Several types of brooding quarters used here in New England are entirely satisfactory. The individual colony house is still the most popular. It should be at least 10' x 12' in size and the larger sizes are preferable in many sections of New England.

Detailed plans for building colony brooder houses, issued by the Wirthmore Poultry Service Department, are available without cost to New England poultrymen upon written request to Wirthmore Feeds, Malden, Mass.

Next in popularity are the large houses with pens 20' x 20' or 24' x 24'. Two brooder units are set up and used in each pen.



Colony brooder house with slot ventilation.

Finally there are the permanent brooder houses with hot water heating systems. Most of these houses are from 20' to 30' deep and the pens are 8' to 10' wide.

All houses used for brooding chicks should be so constructed as to provide proper ventilation at all times. Years ago it was thought that fresh, cold air was detrimental to small chickens, and poultrymen went to all sorts of extremes to shut out the flow of fresh air into the brooding units. One of the surest ways of stunting the growth of chicks and hurting their normal development is to confine them during the first two weeks in hot, poorly ventilated brooding quarters.

When coal, oil, or wood-burning brooders are used, poultrymen should keep in mind that there is an accumulation of carbon monoxide gas from the combustion of these fuels. This gas is heavy; it does not rise to the top of the building but settles near the floor. If this poisonous gas is not removed by the circulation of fresh air, the chicks will be uneven and unthrifty.

Brooder House Equipment

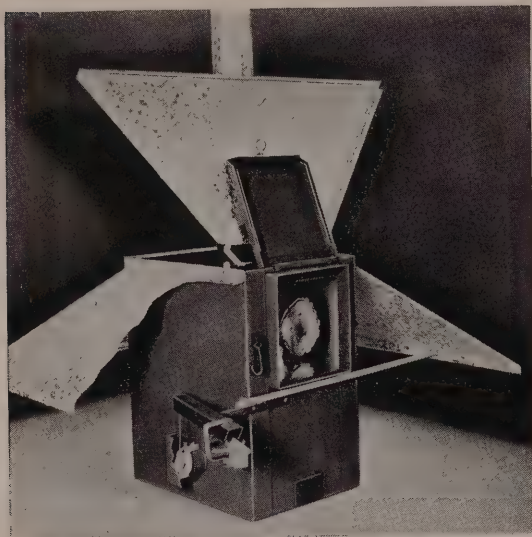
This includes

1. Brooder heating equipment.
2. Necessary hoppers.
3. Water containers.
4. Litter.

Coal-burning brooder stoves still represent the largest percentage of heating units used for brooding chicks in New England. Closely following are the oil-burning, wood-burning, electric, hot-water heated, and gas-heated units. It is not so much the type of heating unit used as the way it is operated that makes for success or failure in brooding chicks. Close observations lead to the following general statements:

Coal-burning brooders provide ample heat to take care of brooding conditions during the most severe winter weather. During warm weather

it is extremely difficult to operate coal-burning brooders so that the temperature is kept down where it should be. In this respect, oil, electric, and gas brooders operate much more satisfactorily. Wood-burning brooder stoves operate very successfully and where a poultryman has his own source of supply for wood or can purchase wood at a low price, there is some saving in fuel cost through use of the wood-burning brooder stoves. All of these types of heating units, with the exception of the electric, represent

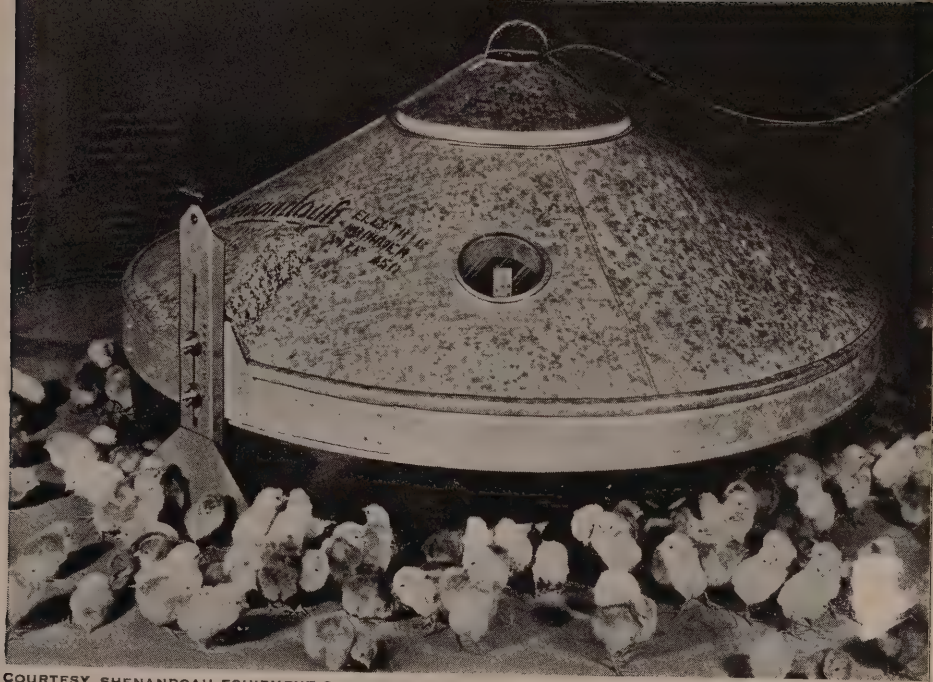


COURTESY SHENANDOAH EQUIPMENT CORP.
Efficient wood-burning brooder stove.

somewhat of a fire hazard and reasonable care should be used in their operation.

Electric brooders eliminate the fire hazard almost entirely. They provide ample heat for the chicks under the hovers but give little or no excess heat to maintain room temperature. Electric hovers are operated successfully in small brooder units without any auxiliary heat. On many poultry plants, however, electric hovers are used in conjunction with the auxiliary heat which provides room temperature.

Hot-water heating units are used on some of the larger poultry plants. Most of them have thermostatic controls that keep a uniform temperature at all times under all sorts of weather conditions. The fuel cost is



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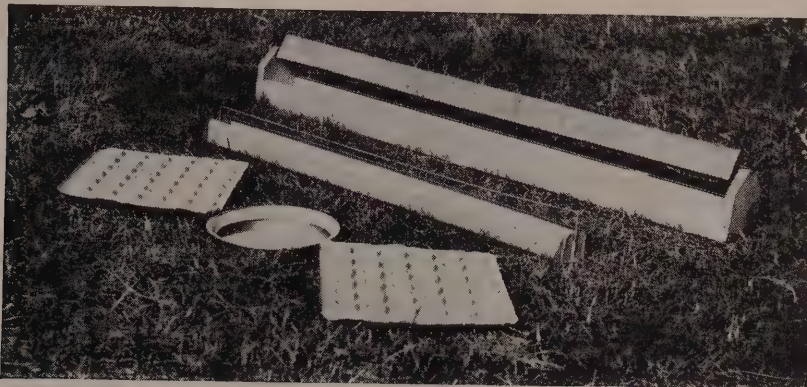
Modern electric brooder.

reduced to a minimum. Of course, the original installation of hot water units represents considerable investment but labor costs are greatly lessened.

Hoppers

At least two sets of hoppers should be used during the first six weeks of brooding,—one set suitable during the first two weeks, and another from then until the chicks are six weeks old. A third and final set—larger and with greater feeding capacity—is advisable for use from the sixth week until such time as the chicks are put on range.

There are a number of sizes and types of hoppers available that are entirely satisfactory. The cost is reasonable enough so that the poultry-



Feeding utensils in the brooder house must meet the demands of the chicks through the changing stages of growth.

man should not hesitate to provide sufficient hoppers to make it possible for all of the chickens in a brooding unit to find a place to eat at the same time. This means that an inch of hopper space should be provided for each chick during the first two weeks; then the larger hoppers should be substituted gradually, and the amount of hopper space doubled so that at least two inches of feeding space is provided for each chick from four weeks on. The best rule to follow is to provide sufficient hopper space so that most of the chickens can eat at one time.

Most popular chick hoppers are made of metal. They can be easily washed and kept clean. If stored away when not in use, they will last for years.

Watering Utensils

Poultrymen should provide two sets of waterers to take care of the chickens in the brooder house during the brooding period; one set for the first three to four weeks, and the other set to be used during the balance of the time.



Plenty of waterers and hoppers in this colony brooder house proved a big help in producing this uniformly sized flock of ten-day-old cross-bred chicks.

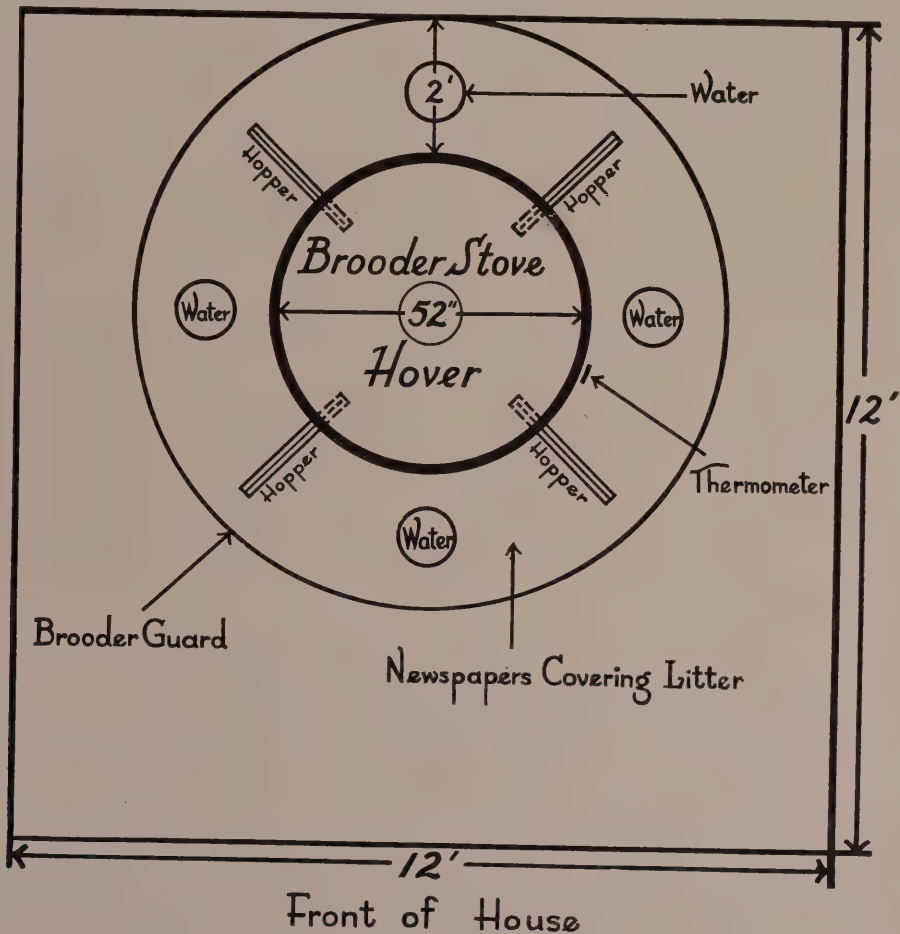
The first set should be of small capacity, from one to four quarts each, with shallow drinking dishes attached so that the chicks cannot get into them and get wet or drowned. At least four of these waterers should be provided for each brooder unit. At three to four weeks of age, one or two containers, each holding from five to ten gallons of water, should be substituted.

Litter

Brooder house floors must be covered with litter. Regardless of the kind of floor in the brooder unit, sand or screened gravel at least one inch deep should be spread over the entire floor. This may be the only litter used. In that case, more sand or gravel should be added after the second or third week. On top of the one inch of sand or gravel other litter can be spread, such as shavings, sawdust, peat moss or processed sugar cane. The use of moldy hay or straw should be avoided. If hay or straw is used, it should be chopped.

Getting Ready for the Chicks

All buildings and equipment used for brooding chicks should be thoroughly cleaned. Washing the floors and side walls of the buildings with hot water and ordinary lye is a recommended practice. For this purpose, dissolve one can of lye in five gallons of water.



Floor plan of a brooder house showing arrangement of brooding equipment in readiness for arrival of the baby chicks.

Be sure that dust and cobwebs are removed from the ceiling and wooden ledges about the building as they collect and hold disease organisms. Brooding quarters can be whitewashed or sprayed with a disinfectant after being thoroughly cleaned.

Caution should be exercised in the use of carbolineum, creosote, or other heavy coal tar products. The heat from brooder units liberates fumes from these disinfectants for several days after application. When one of these disinfectants is used in the brooding quarters, it should be applied several days before the chicks arrive, and the heating units operated during that time. Be sure that the brooder house is ventilated during this preparatory period in order to drive off the fumes which are quite poisonous to small chickens.

Heating units should be set up and operated for several days before the chicks arrive to make sure that everything is working as it should. Put sand or gravel on the floor. If additional litter is to be used, apply an inch or two of it and set up a guard around the hover. To start with, this guard should be set about two feet away from the outside edge of the hover. Inside this guard, cover the litter with three layers of newspapers. This is done to keep the chicks from picking at the litter until they get accustomed to eating feed from the hoppers. Each day, pick up one layer of the newspapers. At the end of the third day, the chicks will be accustomed to eating feed from hoppers and no difficulty from litter eating should be experienced thereafter.

When brooding chickens, the use of a small amount of night light is recommended. If the brooding quarters are wired, a two-and-one-half-watt bulb gives ample light. If possible, this should be suspended under the hover. If this is not practical, suspend it directly over the hover. If electricity is not available, an oil lantern may be used. Brooding with electric lights is recommended only because it helps in teaching the small chicks to hover evenly around the brooder and prevents their bedding down in bunches. Do not use sufficient light so that chicks can eat at night.

Brooder House Temperatures

With the weather variations experienced in New England, and when chickens are being brooded at all seasons of the year, it is not possible or practical to name any specific degree of temperature to which brooder units should be regulated before the chicks are placed around them. A temperature ranging from 85° to 95° two inches above the litter at the outside edge of the hover will generally provide enough heat for the chickens to find a spot where they are comfortable. A room temperature of 60° to 70° during the first week also represents good brooder house conditions.



Note the "rim" of three-day-old chicks around the outside of the hover. Hover temperature and the room temperature are right when chicks bed down like this at night.

The successful poultryman should watch the chickens to determine whether or not they are comfortable. The way they behave and the noises they make, tell him whether his chickens are too hot or too cold, or just right.

Starting off the Chicks in the Brooder Quarters

With the newspapers over the litter and the guard in place, lukewarm water should be put in the small fountains and a fresh daily supply given the chicks during the first few days. Giving baby chicks cold water is apt to start digestive disturbances immediately. Cold water may be used after the chicks are one week old.

The small hoppers should be filled and put in place, and some feed either sprinkled on the clean newspapers, put on paper plates, or on flat pieces of cardboard. Do this for the first two or three days, until the chickens become accustomed to eating from the hoppers.

Feed and water should be placed in front of the chickens right from the start. If chicks are purchased, they are ready to be fed when taken from the chick boxes upon delivery. If the poultryman hatches his own chicks, they should be taken from the incubator and stored in chick boxes for from 12 to 24 hours before being placed under the brooder units. They will then be ready for feed and water.

Commencing with the third or fourth day, feed a small amount of chick-size granite or mica grit. This can be placed in separate containers, or a small quantity may be sprinkled on top of the feed in the hoppers once a day.



Chicks deserve a good, clean start. Note the newspapers covering the floor.

At the end of three days, move back the guard and from then on, use it only in case of an extremely cold night, or when difficulty is experienced in maintaining proper brooder temperature. Start moving the feed hoppers and the waterers away from the heating unit and gradually get them located in the cool section of the brooder quarters. This will get the chickens accustomed to lower temperatures and tend to harden them off.

Watering

Chickens should never be without water. If this happens, they are very apt to drink large quantities of water when it is made available. This will cause a variety of troubles.

With few exceptions, it is recommended that nothing be put in the drinking water of small chickens. Included in these few exceptions is Epsom salts when its use is indicated. One such use is when the poultryman knows he has overheated or chilled his chickens during the first week or two of brooding. Just as soon as this heating or chilling has occurred, the poultryman should dissolve two level tablespoonfuls of Epsom salts in a gallon of water. Put enough of the Epsom salts solution in all of the drinking fountains so that the chickens will have it to drink for a period of from four to six hours; then empty out all that remains and refill the

waterers with fresh water. In some cases this Epsom salts treatment will tend to overcome indigestion with its resultant pasting.

Litter

Start with an inch or so of sand or screened gravel, with another inch or two of some other litter placed on top of it, or two inches of sand or screened gravel used alone. This quantity of litter is all that is needed for the first two or three weeks. At the end of two to three weeks, small amounts of litter should be added every few days until a litter four to six inches deep has been built up. This should be raked or stirred every day or two, and any patches which have become caked should be removed.

When using this deep litter system, it is highly important to be sure that the litter is dry at all times. Some poultrymen have found that using a shallow litter and changing it every three to five days works more satisfactorily when conditions are such that coccidial outbreaks cannot be controlled with deep litter.

Humidity

As an aid in controlling coccidiosis, poultrymen for many years have seen the advantages of keeping the brooder house dry. However, the air in the brooder house should contain a relatively high amount of moisture or humidity during the first two or three weeks of brooding. There is much experimental evidence to indicate that most of the heating equipment used in brooder houses tends to exhaust a considerable quantity of the moisture from the air. Keeping a pail of water on top of the brooder, wherever the construction permits, is helpful. Putting another pail of water under the hover, close to the heater, covered with wire so that chickens cannot get into it, also helps to keep some moisture in the air.

After the first two or three weeks, the quantity of water the chickens drink and the resulting moisture in their droppings, will tend to keep the humidity in the brooder house at a satisfactory point without employing other means.

Wire Platforms for Feed Hoppers and Water Receptacles

The use of wire platforms on which to set all water receptacles and feed hoppers after the chickens are one week old is recommended. From the standpoint of sanitation this is highly desirable. Water spilled around the containers goes through the wire. The litter under the wire can be removed occasionally, and, by so doing, prevent damp litter from spreading over the house.

Feed wasted from the feed hoppers goes through the wire and is out of reach of the chicks; otherwise, it would become mixed with the litter and droppings, and the chicks, in picking over this material, would be apt to pick up some form of infection that would start trouble. These wire platforms need to be only two inches to four inches high and should be covered with 1" or 1½" mesh, 16-gauge wire, or with 1" x 2" 14-gauge welded wire fabric, which is durable and will last for many years. The most satisfactory wire platform is one extending across the entire width of the pen and placed at the front of the house.

Roosting

Most of the difficulty in getting chickens to roost is due to the failure to provide proper roosts for them early enough in life. As a general rule, roosts should be placed against the back wall of the brooder house by the time chickens are three weeks old. Obviously, the roosts must be low; anywhere from six inches to one foot from the floor at the start.



Six-week-old chicks all roosting at night on low wired roosts 6" high and placed at the rim of the pen.

There are many types of suitable roosting frames. Those that are wired, with the wire nailed on the under side of the roosts, are recommended. These roosts may be made of 1" x 2" furring and spaced 6" to 8" apart. The frames must be fitted to the brooder house so the chickens cannot get in the droppings underneath the roosting area. However, when such

frames cannot be provided, birch poles, strapping, etc., can be put in and an opportunity to roost made available by the time the chicks are three weeks old.

The big advantage of getting young chickens to roost lies in the opportunity to reduce the heat and to bring the time nearer when artificial heat can be dispensed with entirely. When the chickens sit on the floor at night, there is the chance that they will pile up and smother.

When to Separate the Sexes

Separate the sexes just as soon as the cockerels can be detected. By the time the chicks are seven weeks old, it is possible to remove practically all of the cockerels. If all-pullet chickens have been purchased and 250 or more of them have been placed in a brooding unit, they should be given double the amount of floor space before they are seven weeks old. In other words, chickens at six weeks of age require much more floor space than is necessary during the very early stages of brooding.

Outside Management Around Brooder Houses

Wherever possible, an outside run should be provided for chickens and they should be encouraged to use it after they are two weeks old, when-



Gravel runs used in "hardening off" chicks under rigorous winter conditions.

ever weather conditions permit. Yards about the size of the brooder house itself and covered with two or three inches of sand or gravel probably are best.

Of course, if late in the season and colony brooder houses are used and located on a clean field covered with grass, the chickens can be let out at an early age.

Feed and water should be supplied in the outside runs. Chickens should not be allowed to run under the brooder houses, as lack of sunshine and poor circulation of air soon provide conditions under which contamination from disease organisms is very apt to start. When the soil around brooder units cannot be made suitable, wire platforms can be used.

Two Systems of Feeding Chickens

Although several ways of feeding chickens are used, all of them fall into one or the other of two feeding systems. When scratch grain is used with mash, it is called the scratch-and-mash system. When scratch grain is not fed, it is known as the "all-mash" or preferably the complete ration system. In both systems, feed in pellet form may be used at times but this does not change the basic nature of the feeding system. In New England, Wirthmore has pioneered and continues to bring greater perfection to both systems of feeding. Poultrymen may choose the one most suited to their conditions with assurance that Wirthmore poultry feeds for either system are designed to give the best possible returns.

Regardless of which of the two systems is followed, field observations lead to the recommendation that chickens be given a small amount of feed two or three times a day, letting the hoppers become entirely empty at least once a day—preferably in mid-afternoon. This method of feeding eliminates a great deal of the wasting of feed that has occurred in the past, caused by filling the hoppers too full, in an attempt to make it unnecessary to have to feed more than once or twice in 24 hours. An intermittent feeding schedule also tends to prevent the chicks from picking over the feed. Chicks should not be out of feed for more than an hour at any one time, and a regular schedule of feeding should be followed. If this method of feeding is adopted, it should be practiced right from the start and not inaugurated after continuous feeding has been practiced.

Feeding Scratch-and-Mash During the Brooding Period

Wirthmore Baby Chick Starter is fed to chicks during the first six weeks when the scratch-and-mash system is used. Wirthmore Baby Chick Starter alone may be fed through this period. In that case the chicks will grow as rapidly as breeding and care permit. The use of starting mash without scratch grain during the first six weeks is the simplest and most common practice, even among poultrymen following the scratch-and-mash system.

Some poultrymen prefer to feed scratch grain with the starting mash during the first six weeks. Since Wirthmore Baby Chick Starter contains liberal margins of all the food elements chicks need, it is especially fitted for use with scratch grain. Wirthmore Baby Chick Scratch and Wirthmore Intermediate Scratch Feed are mixtures of yellow corn, wheat and hulled oats, properly sized for young chickens. One of two methods of feeding scratch grain with Wirthmore Baby Chick Starter may be followed:

1. During the first two weeks, scatter Wirthmore Baby Chick Scratch in the litter three or four times daily at the rate of one-half pint per 100 chicks. During the third and fourth weeks, feed one pint daily per 100 chicks. At five weeks the chickens will be large enough to eat Wirthmore Intermediate Scratch Feed, which should be fed twice daily in the fifth and sixth weeks. To each 100 chickens feed one quart early in the day and all they will eat in two hours, before dark.
2. The other method is to feed the scratch grain in hoppers. During the first four weeks all the Wirthmore Baby Chick Scratch the chicks will clean up before dark is put in hoppers late in the afternoon. During the fifth and sixth weeks Wirthmore Intermediate Scratch Feed is kept in hoppers before the chickens at all times.

Scratch-and-Mash Feeding After Six Weeks

Improved results follow separation of pullets from cockerels when they are six weeks old. Wirthmore Growing Mash should be kept in hoppers before the pullets after they are six weeks old, and until they have matured. In addition to this mash, scratch feed should be kept before the flock in hoppers, or hand fed in the litter, or both. If all of the scratch grain is hand fed, in the morning scatter as much as will be eaten in an hour, and late in the afternoon give the birds all they can eat in about two hours. Wirthmore Intermediate Scratch Feed should be replaced by Wirthmore Scratch Feed when the chickens are eight weeks old. They are then large enough to eat this coarser, lower priced scratch grain. If the cockerels must be kept throughout the brooding period with pullets fed in the foregoing manner, their growth for either breeding or market purposes will be as satisfactory as such brooding conditions allow.

An important advantage to be gained from separating the sexes early is the opportunity to feed the cockerels with greater economy. Cockerels to be used for breeding should be fed in the same manner as the pullets, even when separated. Those which are to be sold as broilers or roasters, if separated from the pullets, may be fed Wirthmore Special Broiler Feed to great advantage. Commencing on page 127, the use of this feed is fully described.

Feeding Chicks by the Complete Ration System

When chickens are to be fed by the complete ration system, Wirthmore Complete Chick Starter and Broiler Ration is used throughout the brooding period. This single feed mixture contains all the food elements chickens require from day-old until ten or twelve weeks of age. It is only necessary to keep this ration in hoppers before them, following previous recommendations regarding hopper management. No supplementary feeds are needed because the ration is complete. Scratch grain should not be fed with it. After the pullets are ten or twelve weeks old, change to Wirthmore Complete Growing Ration.

Cockerels intended for use as breeders are fed like pullets. When cockerels to be sold for meat cannot be fed separately from pullets, Wirthmore Complete Chick Starter and Broiler Ration is unexcelled for the economical production of high quality broilers.

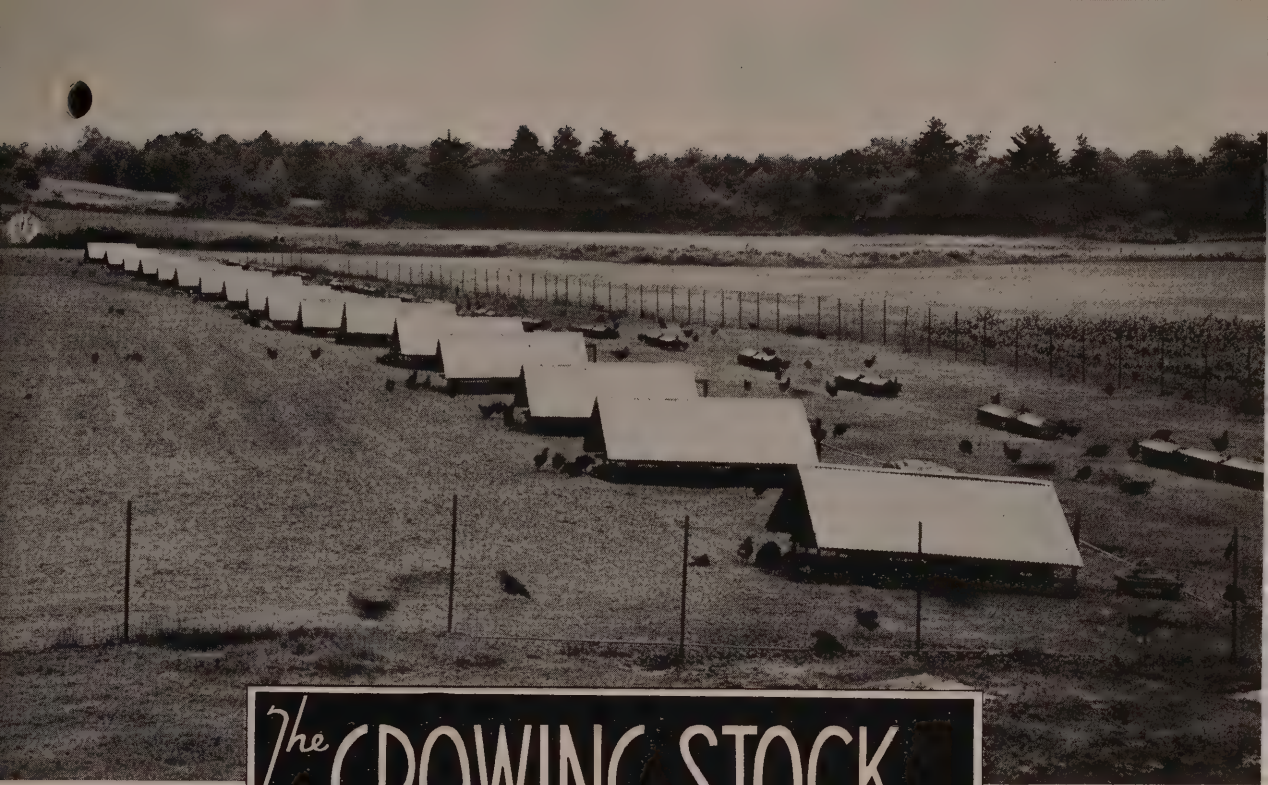
If the cockerels are separated early and it is convenient to feed pullets and cockerels different rations, Wirthmore Special Broiler Feed offers a new measure of economy in meat production. The use of this feed is described in the section "More Income From Meat", commencing on page 127.

Chick Management "Do's"

1. Plan chick purchases well in advance of your needs.
2. Take time off and visit those from whom you would like to purchase chicks.
3. Wash and scrub all brooder quarters and equipment.
4. Operate heating units several days before chicks arrive.
5. Have litter, guard, feed, and waterers in place before putting down chicks.
6. Reduce both hover and room temperatures just as fast as possible and still have the chickens comfortable.
7. Feed two or three times a day and let hoppers stay empty for one hour during the early afternoon.
8. Let chicks out in suitable yards or runs when weather permits.
9. Use a deep litter and stir it frequently.
10. Plan to cut number of chicks in brooder unit in half at six to seven weeks.
11. See that chicks have an opportunity to roost when three to four weeks old.
12. Keep brooder units clean and in such shape that you will be glad to show them to your friends.

Chick Management "Don'ts"

1. Don't let price be the dominating factor in your chick purchases.
2. Don't expect to get chicks from good sources without giving an order well in advance of your needs.
3. Don't put chicks in dusty, poorly ventilated brooding quarters.
4. Don't plan for over 300 chicks in any one brooder unit.
5. Don't make a hothouse product of your chicks with too high temperatures.
6. Don't fill feed hoppers full and let chicks waste feed.
7. Don't keep guard too close to brooder unit or continue its use indefinitely.
8. Don't let wet, caked litter accumulate on the floor.
9. Don't use lights that are large enough to permit chicks to feed at night.
10. Don't let chicks bed down in the corners of the brooding unit.
11. Don't put so-called "chick remedies" in the drinking water.
12. Don't let cockerels and pullets stay in the same units any longer than necessary.



The GROWING STOCK



THE slogan "You Can't REBUILD a Pullet" has made poultrymen realize as never before that they have very definite responsibilities in the care and management of their growing stock after it leaves the brooder houses and while being prepared for the laying house season.

The old idea that poultrymen can sit back, breathe easily and more-or-less forget their growing stock after it is put on range, has proved to be a very false one and has brought disaster to many a short-sighted poultryman. The feed used and

the management practices followed during the growing period are just as important as during the brooding period just passed or the laying period ahead.



MANAGEMENT—FEEDING

Ranges

There are three types:

1. Permanent Range.
2. Cultivated Range.
3. Back-Yard Range.

Years ago, it was thought necessary to put growing stock on new pieces of range every year; or, to state it another way, use the same piece of land for a range only every third year.

Today, the use of a permanent range wherever suitable conditions exist is growing in popularity. To be suitable, a permanent range must have the following characteristics: land that is well sodded and well drained and offering some natural shade. Where a poultryman has land of this



A good permanent range. Plenty of green sod and natural shade.
Land well drained.

type available, he can expect to grow normal, healthy birds year after year in the same location. It is essential, however, that he does not overcrowd this permanent range and thus get the land contaminated.

In handling a permanent range, certain management practices must be rigidly carried out. First, all feed hoppers should be moved at least once a week. Many poultrymen move their hoppers a short distance almost every day. This is done, of course, to prevent contamination of the ground around the hoppers and the killing out of the sod.

Second, if a permanent water system is not used, the water receptacles should also be moved weekly. Where permanent water receptacles are

used, the ground around them should be kept clean. A small amount of clean gravel around the receptacles helps to maintain sanitary conditions. Permanent water receptacles should be set on a wire platform over a dry



At least once each week move the hoppers.

well. This takes care of most of the spillage and is an aid in maintaining sanitary conditions around the water receptacles.

The grass on a permanent range should never be allowed to grow over six inches high, which means that it must be mowed frequently, depending upon the amount of rainfall and the rapidity with which the grass grows. One of the big advantages of using a permanent sod range is that if kept mowed it provides growing pullets with a supply of short, tender, green grass. Much experimental evidence has been made available in the last few years to indicate that such a range cuts feed costs anywhere from 10 to 25%.

The ordinary grasses that grow here in New England on hay fields and pasture lands provide a good green-grass diet. In fact, growing birds will leave alfalfa and clover for timothy, red top, Sudan grass, blue grass, etc.

The range shelters, or other buildings used on a permanent range should be kept far enough apart so that the birds will stay in small units, more or less by themselves. If growing pullets are allowed to congregate in large numbers in a small area, the sod is killed and the range is spoiled for use. Many poultrymen find it practical to set the shelters close together if good shade is available, and if the hoppers and water receptacles are moved away from the shelters regularly.

By putting the shelters close together in an open area within sight of the residence, or in an area not readily accessible from the outside, protection against thieving is offered. This arrangement of shelters is not recommended where growing pullets of different ages are ranged together, or where suitable shade is not available.

Growing pullets can be taught to travel long distances from the shelters for feed and water. At the start, the hoppers and water receptacles are placed near the colony houses, or shelters, and are then moved a reasonable distance away each day.

The ideal permanent range, of course, is one that has a type of soil that will maintain a good, heavy sod, be well drained, and have enough



Note all low-hanging limbs and brush have been cleared away to let in some sunshine and to allow free circulation of air.

natural shade so that the birds can take advantage of it throughout the greater part of the day during the hot months of July and August. Hoppers and movable water dishes should be moved frequently and kept in the vicinity of the shaded area. Permanent water outlets should be located where they get exposure to the sun for at least part of the day.

Cultivated Range is land that is not in sod and cannot be kept in sod. Such ranges are generally plowed in the fall and seeded with winter rye; or they are plowed early in the spring and seeded with oats. This provides green stuff for a very short time. After that is gone, it is desirable and almost necessary that the land be harrowed frequently during the balance of the season.

The Back-Yard Range: Here in New England there are hundreds of persons raising poultry who have only back-yard conditions for their growing birds. The back-yard range may have a coating of clean, fresh

gravel applied two inches deep, once a year. The range may be divided into two or three yards which may be dug up and planted to green stuff in rotation. About the only thing a poultryman can hope to do with back-yard range is to keep it from becoming hard and caked. The ground should be loosened up and exposed to the sun and air. This will help materially in keeping contamination or infection from disease organisms under control.

Shade

Like most everything else, shade is of two varieties — good and bad. Good shade is represented by rather high trees, and no low-growing shrubbery. This keeps out the direct rays of the sun but gives ample opportunity for air drainage and enough sunshine to keep the land free of contamination.

Bad shade means shrubbery, weeds, bushes, etc., that lie close to the ground, preventing any sunshine from working through and preventing air circulation to such an extent that the ground quickly becomes contaminated.

Poultrymen have learned that it pays to take proper care of the land that they are using for range purposes for their growing pullets. On a large scale, of course, this requires the use of farming machinery such



When natural shade is not available, a tent made of cotton grain bags offers a cheap and effective substitute.



as plows, harrows, mowing machines, etc. On the small back-yard ranges, it just means plenty of hard work with a spade, fork, and rake.

Artificial shade should be provided where no natural shade is available. Do not make it necessary for growing pullets to stay in or around the range shelters or colony houses during the hot summer days. Cotton grain bags sewed together into large sheets and spread over frames placed three or four feet above the ground give protection from the hot sun. Cut brush or evergreen branches may be used similarly. Feed hoppers and water utensils should have protection of this sort, because growing pullets will not stand out in an open field in the direct rays of the sun and eat and drink during the hottest part of the day.

Corn and sunflowers planted in rows at least five feet apart, with not over four or five rows in each strip, make ideal shade for growing pullets, provided the pullets are not put on the range too early. Plant the strips of corn and sunflowers as early in the season as possible and at as great a distance from the shelters as seems practical.

Housing Growing Stock on Range

Probably close to two-thirds of the growing pullets in New England are housed in range shelters of one type or another. Pictured on next two pages are two types that are recommended by the Wirthmore Poultry Service Department.

Plans giving all dimensions, bill of materials, etc., are free for the asking by writing direct to Wirthmore Feeds, Malden, Massachusetts.

All range shelters, of whatever size or construction, should have wired bottoms so that the birds do not have access to the droppings. The shelters should be lifted off their foundations and the droppings removed at



least once a month during the growing period. It is good range management not to move the range shelters during the growing season, but to frequently clean out the droppings underneath, and also rake or sweep the ground around the shelters, thus getting rid of the droppings that accumulate close to the shelters.



The Wirthmore economy range shelter. Capacity, 100 pullets to maturity. The material cost approximately \$10. Picture taken in late August after the 100 pullets had been housed. Note grass growing close to shelter. All feed hoppers and waterers were kept at a distance from the shelter.



An 8' x 9' Wirthmore range shelter. Capacity, 125 pullets to maturity.
All material cost approximately \$16.

Colony brooder houses with floors in them should be moved as often as the land around them shows signs of becoming bare or contaminated.

All range shelters should have a coat of carbolineum, creosote, or other red-mite repellent each year before birds are put in them. This procedure is a safe, cheap method of controlling red mites during the hot summer months.

The open framework of every shelter should be covered with wire so that the birds can be confined. During the night, as a rule, the door is shut and the birds are confined. They should be let out soon after daylight. Usually there is no feed and water available in range shelters. Cannibalism and feather pulling are bound to get started if birds are kept shut in for three or four hours after daylight. If the poultryman is sure that foxes, dogs, and other enemies of poultry are not going to bother, it is a good practice to leave the doors open and let the birds go out at will each morning.

There are various devices designed to let the birds out of the range shelters in the morning, and also to keep other animals from getting in during the night. However, most poultrymen have found that their principal losses occur after the birds get out on the range in the early morning instead of in the shelters during the night.

Regardless of the type of house used on the range, growing pullets should never be overcrowded. Six inches of roosting space should be provided for each pullet.

Transferring Pullets to the Range

Pullets put in range shelters during March, April, and May require a little additional protection from the weather for one or two weeks. This is easily provided by pinning grain bags on the two sides and back of the shelters, but not on the front. Poultrymen who leave these bags on the shelters after the pullets have become accustomed to outside weather conditions are really losing the big advantage provided by a range shelter — the free circulation of air.



If possible, put only 25 or 30 pullets in a shelter at the start. It is a good idea to provide temporarily, a small wire-enclosed yard in front of the shelter. This will keep the pullets from wandering away and will help in getting them to go into the shelter at night. After this small number of pullets is roosting, and running in and out of the house at will, put in the balance of the pullets. This second installment will usually follow the original lot of birds into the shelter and onto the roosts. This method often saves the poultryman a lot of aggravating work just at dusk.

Range Hoppers

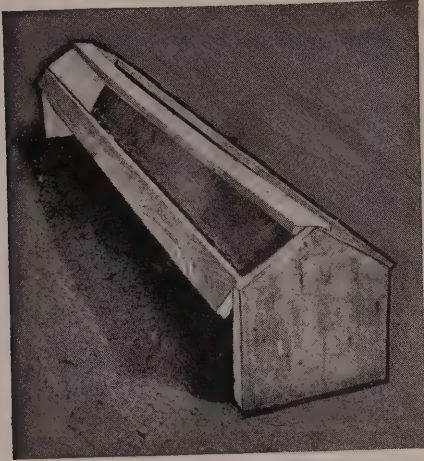
Pictured below is the Wirthmore Range Hopper that is widely used



Wirthmore no-wet range hopper.

throughout New England. Plans giving dimensions, bill of material, etc., will be sent without cost to New England poultrymen upon request. Write direct to Wirthmore Feeds, Malden, Massachusetts.

At least two of these six-foot hoppers, and preferably three, should be provided for each hundred pullets put on range. These Wirthmore hoppers are constructed so that they can be used by pullets from the time they are eight weeks of age until they reach maturity.



A simple, open, V-shaped trough hopper

When birds are fed daily on range, a simple, open, V-shaped trough hopper proves a satisfactory alternative. It tends to cut down hopper expense, yet provides the desired amount of hopper space. Poultrymen should be sure that feed in open hoppers is cleaned up by the birds each day. If it is not, any remaining feed which may have become wet must be removed by the poultryman before filling the hoppers with fresh feed.

Watering

If running water is piped to a permanent range, automatic floats can be used to advantage and permanent locations established. Where this is



An inexpensive means for providing fresh water on a small range.

not feasible, the water receptacles should be moved frequently and, if possible, kept in the shade.

There are many devices for saving time and labor in watering birds on range. The use of barrels holding two or three days' supply of water is not recommended, due to the fact that in hot weather the water in the barrels becomes warm, and also because it is extremely difficult to keep such containers clean. Cases of paratyphoid in the flock have been traced to water handled in this way on the range.

When a permanent water system is not used, it is probably best to carry fresh water to the range at least once a day. Below is picture of a truck carrying a tank from which the water receptacles can be filled daily.



This truck and tank cost the owner just \$45. With it he provides 2000 pullets on range with fresh, cool water daily at a minimum of expense and labor.

Grading

It is a good idea for poultrymen to grade their pullets. At the time pullets are put on range those that are not definitely thrown out as culls, but show signs of lagging a little behind the general flock, should be put in a shelter by themselves. They are more apt to develop normally this way. If they do not, it is much easier to take them out and dispose of them later on in the growing season.

Pullets should be carefully graded again when put in the permanent laying quarters. The earlier-maturing, more precocious, alert pullets should



The good and the poor of it. These two White Rock pullets photographed at seven weeks of age are out of the same lot, grown under identical conditions, and fed the same ration.

be penned up together. The later-maturing, more docile, timid pullets will generally come along and do much better if put together in separate pens.

Culling

Pullets should be culled thoroughly when put on range and any questionable ones should be sold. Heavy range mortality may be reduced by proper culling at this time.

During the growing period, no program of culling is recommended other than to catch and dispose of any diseased birds or others that do not show ability to grow and keep up with the flock as a whole.

Prevention of Poultry Thieving

Records available show that on the poultry plants displaying tattoo signs, poultry thieving has been reduced to a minimum. The expense and labor involved in tattooing is more than offset by the protection afforded. Every state is cooperating through its state police departments in giving protection to tattooed flocks. Tattoo outfits can be purchased at a nominal price in all of the New England states. Plan to tattoo your birds when you put them on range. For further protection against poultry thieving, a sound pick-up system is also proving successful and is fairly inexpensive.

Vaccination

Fowl pox vaccination is now part of the regular program on all poultry farms in southern New England. In Maine and Vermont, where fowl pox is not a problem, vaccination is seldom necessary.

Early hatched pullets should be vaccinated after they are eight weeks old and should then be left in the brooder house for two weeks before being put on range. Otherwise they should be put out on range and left there for two or three weeks before being vaccinated. This program is necessary, due to the unfavorable weather conditions that prevail during March and April when early hatched pullets are normally put on the range.

Normal or late-hatched pullets can be vaccinated any time after they are six weeks old. After the middle of May, they may be vaccinated at the time they are put on range, thereby saving a handling.

Prior to the first of May, no birds should be vaccinated at the time they are put on range. Pullets not vaccinated before or at the time they are put on range should be vaccinated three or four weeks prior to reaching maturity.

This program of vaccination does not upset the birds to any great extent. Vaccinating after they come into production and are housed may seriously interfere with production for some time.

Directions for Vaccinating to Prevent Fowl Pox

1. Purchase two #10 sewing machine needles. Insert blunt ends into a cork stopper so that needles are firmly held about $\frac{1}{4}$ " apart.
2. Secure the vaccine and keep it under refrigeration until ready to use it.
3. A short time before using, empty the contents of the sealed vial into the bottle containing the liquid. Shake well.
4. A convenient method for keeping the container upright while vaccinating is to insert the bottom end of it through a hole in a heavy piece of corrugated cardboard. The hole should be made a trifle smaller than the container itself. The piece of cardboard should be of sufficient size and of proper proportions to enable the vaccinator to sit on one end of it and thereby have a convenient "table" on which the bottle of vaccine is securely held in front of him between his knees.
5. The vaccinator should dip the points of the needles into the vaccine before vaccinating each bird. Touch the side of the needles to the bottle after dipping, in order to prevent the excess from dropping off on the floor or onto the bird and perhaps causing trouble.
6. Each bird to be vaccinated should be held by a helper. He should hold the bird by its legs with its head down and its back next to him. He then should spread one of the bird's wings to bring into view the web of the wing. The vaccinator then pushes the needles *way through this web* from the under side, withdraws

them and dips the points into the vaccine to follow the same procedure on the next bird.

7. It is possible to vaccinate at least 500 birds an hour by this method where sufficient help is available. A good working crew consists of four persons, — one to catch the birds, one to hold a supply of them, one to hold the bird with its wing spread out in proper position, and one to do the actual vaccinating.



When Should Pullets be Placed in Permanent Laying Quarters?

The answer to this question is dependent entirely on the time of year when birds are maturing, the kind of range on which they have been grown, and the section of New England in which the poultryman lives.

The general recommendation is that pullets be housed when they have reached about 10% production.

Early hatched pullets come into production during hot weather. If a permanent sod range provided with good shade facilities is available, nesting equipment should be installed, the maturing pullets left on this range during the hot summer months and not housed until cooler

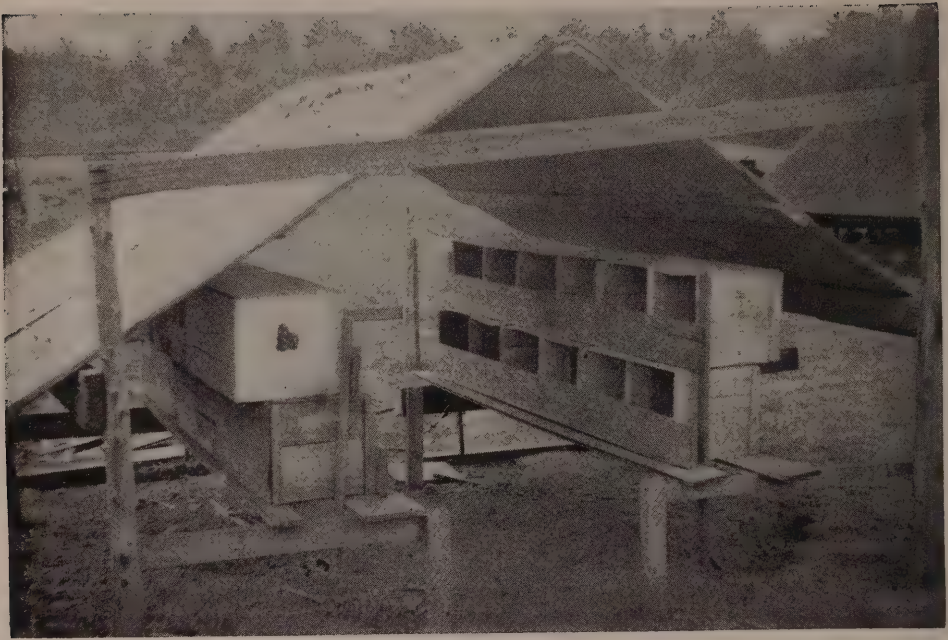
weather. Their living conditions during the hot summer months are much more comfortable on a good range than in the average laying house. They have an opportunity to continue to build up vitality and resistance under a healthy environment.

On the other hand, if there is no shade, if the range is bare, and no green stuff is available, the birds undoubtedly will be better off physically and produce more satisfactorily if housed at the time they are laying 10%. There are many advantages in housing all birds, with the exception of early hatched pullets, when they have reached about 10% production. Feed intake can be better controlled and body weight is more easily maintained. There is also less danger of early cannibalistic outbreaks because birds become accustomed to the pens and lay in the nests instead of on the floor. Still another advantage is that there is less danger of the pullets contracting colds or other respiratory troubles incidental to overcrowding and adverse fall weather conditions. In addition, housing birds before they have exceeded 10% production guards against a high mortality from ruptured egg yolks due to handling or undue nervous tension which accompanies change of environment.

Following are pictures of two different types of nest arrangement that have proved satisfactory on some permanent ranges.



A nest shelter built on skids and moved each year to a new range. The metal nests are used all winter in the permanent laying quarters.



A cheap, yet satisfactory, nest shelter on range.

Confinement Rearing of Pullets

Where there is no suitable land on which to range the growing pullets, or where out-of-season pullets are being grown, it is entirely possible to grow good, healthy pullets entirely in confinement. This refers only to birds being raised on the floor. Those grown in cages are discussed in another section of this book.

It is essential that pullets reared in confinement during the summer months be given plenty of room. Each pullet should be allowed three square feet of space, or almost as much as is allowed a mature laying hen. Wherever possible, a small gravel yard or wire porch should be provided in order that the birds can get out into the open during that time of day when the yards and runs are in the shade.

Feed Management of Growing Pullets

Provide plenty of hopper space for pullets on range. Growing birds should be fed every day and hoppers allowed to get empty some time after midday. About two hours later, fresh feed should be put into the hoppers, but only in such amounts as will be eaten in the next 22 hours. This program of feeding results in less feed waste, makes the birds utilize the range to better advantage, and encourages them to eat more of the available greenstuff.

Grit and Oyster Shells

Regardless of the type of range, a supply of granite or mica grit should be available to growing pullets at all times. When the birds "red up" and show signs of coming into production, oyster shells should be provided in addition to the grit. Limestone grit may be used at this time in place of the insoluble grit, in which case it will not be necessary to use oyster shells. Limestone grit, however, should not be fed to growing pullets until they are ready to lay, since an excess of calcium is injurious to their best development.

Feeding Wirthmore Growing Mash and Scratch Feed on the Range

Scratch grain is always fed with Wirthmore Growing Mash. If the chickens were started on Wirthmore Baby Chick Starter, Wirthmore Growing Mash and Wirthmore Intermediate Scratch Feed should be fed to the pullets when they are six weeks old.

If started on Wirthmore Complete Chick Starter and Broiler Ration and fed mash and scratch on the range, the pullets need not be shifted to Wirthmore Growing Mash until from nine to twelve weeks of age.

After pullets are about eight weeks old, they will be able to eat Wirthmore Scratch Feed.

Scratch grain may be fed by one of three methods:

1. Hand feed on the ground once daily, in the late afternoon, all the scratch grain the birds will clean up before dark. Scatter it on a clean spot each day, starting near the shelter or house and moving constantly toward a cleaner part of the range. Part of the grain may be put on top of the mash in the hoppers, but the bulk of it should be spread over the ground.
2. Hopper feeding the scratch grain as well as the mash is the most common range practice. Late in the afternoon enough scratch feed is put in hoppers to last the birds until early afternoon the following day.
3. Hopper feeding and hand feeding are often combined. Hoppers are supplied with sufficient scratch feed to last until early afternoon. Late in the afternoon when the hoppers are replenished, some grain is also scattered over the ground. This practice prevents crowding around the hoppers, which usually occurs shortly before the pullets go to roost.

When mash and scratch-fed pullets mature and reach 10% production, they should be fed a laying ration even though they are left on range.

Feeding Wirthmore Complete Growing Ration on Range

Begin to feed Wirthmore Complete Growing Ration when pullets are from nine to twelve weeks old. This growing ration should never be fed

before the birds are nine weeks of age, whether the chickens were started on Wirthmore Baby Chick Starter or on Wirthmore Complete Chick Starter and Broiler Ration. Scratch grain should never be used with Wirthmore Complete Growing Ration. Pullets should be fed this ration until they have reached approximately 10% production, at which time they should be changed to Wirthmore Complete Egg Ration or Wirthmore Complete Laying Ration.

When and How to Feed Pellets to Birds on Range

Under certain conditions, it is advisable to use pellets for birds on range, whether they are fed Wirthmore Growing Mash and scratch feed or Wirthmore Complete Growing Ration. Circumstances will determine whether Wirthmore Growing Pellets or Wirthmore Super Pellets are the best choice.

Growing pullets at times go off feed and require special feeding to promote normal growth. Wirthmore Growing Pellets are effectively used in these cases when it is simply desirable to increase feed intake.

Chronic coccidiosis and worm infestations are commonly encountered. Today, several respiratory diseases sometimes affect pullets during the growing period. When such conditions arise, prompt measures should be taken to control them. In addition, the feeding program should be adjusted to keep up feed intake and to prevent a serious setback in growth or condition. If the disease is not severe, the use of Wirthmore Growing Pellets should be adequate. When the flock is seriously affected, Wirthmore Super Pellets have superior values for helping the birds to recuperate.

Whichever pellet is used, begin feeding it as soon as trouble is detected. For each 100 pullets, feed not less than two, nor more than four quarts of pellets daily in addition to the regular ration. All of the pellets may be fed in hoppers or scattered on the ground late in the afternoon. When health and appetite return to normal, the use of pellets may be gradually discontinued.

Wirthmore Growing Pellets also have distinct value for use in connection with Wirthmore Complete Growing Ration during the last few weeks before pullets are normally housed. When growing conditions have been adverse and the pullets have not acquired satisfactory body weight, a liberal use of Wirthmore Growing Pellets is strongly recommended.

Permit the birds to eat all they want by keeping pellets and growing ration in hoppers before them.

Range Management "Do's"

1. Clean out all low bushes and low-hanging limbs on the range.
2. Keep grass cut, to provide tender, succulent green feed.
3. Paint all range houses with mite-destroying paint before using.
4. Provide wire bottoms for all range shelters.
5. Locate all range buildings on high spots with drainage away from them.
6. Clean out droppings once a month.
7. See that growing pullets are kept supplied with clean water.
8. Plan to practice the clean-up method of hopper feeding on range.
9. Move feed hoppers each day or at least once every week.
10. Provide suitable nests on range.
11. Provide oyster shells or limestone grit when maturing pullets show signs of coming into production.
12. Cull all inferior pullets.
13. Plan to range growing pullets as far away from the laying stock as possible.

Range Management "Don'ts"

1. Don't use old, bare ground without plowing or spading it during the entire growing season.
2. Don't bag shelters and leave the bags on after pullets get hardened to range conditions.
3. Don't overcrowd your range.
4. Don't expect growing stock to do well with stale drinking water.
5. Don't let ground around feed hoppers and waterers become contaminated.
6. Don't keep birds shut in range buildings for three or four hours after daylight.
7. Don't let pullets drink from holes on the range. Fill them in.
8. Don't feed scratch grains on filthy ground.
9. Don't put off vaccination against fowl pox, when it is necessary, until pullets are laying.



WIRTHMORE DEMONSTRATION FARM

Plan to visit the Wirthmore Demonstration Farm, Lynnfield Center, Massachusetts, any day you can except on a Sunday or holiday. Fred McComiskey (right) will be glad to greet you and to show you around the Farm. He speaks the poultryman's language and knows his chickens.



The LAYING FLOCK



THIS section applies to “floor” birds housed in regular laying quarters and kept primarily for the production of market or hatching eggs. Those interested in “caged birds” or in birds kept for breeding purposes will find special sections covering those subjects elsewhere in this book.

Housing and Equipment

Like all phases of poultry husbandry, the type of house in which laying birds are kept has gone through a never-ending process of change or evolution.

It would seem that the ideas have followed a cycle to some extent. The warm, “air-tight”, glass-front, shallow type of laying house of the early part of the 1900’s was followed by the exact opposite, or “open-front” house, where temperature was approximately the same inside the house as outside.



MANAGEMENT—FEEDING

While the open-front house is still popular in some sections, the trend is swinging again toward the insulated, properly ventilated glass-front house, which is growing in popularity for three or more reasons:

1. It is more comfortable for the layers. It is warmer in winter and cooler in summer than the open-front house and thus tends to lessen sudden changes in temperature. It practically eliminates freezing of water in the winter and condensation on ceiling or walls in the form of frost or water, making it possible to restrict ventilation to a greater extent without danger of wet litter; it reduces danger of heat prostration in extremely hot weather; and if properly operated, it may help in preventing respiratory troubles.
2. It is more comfortable for the poultryman or attendant.
3. The labor costs are reduced. The litter is more likely to remain dry and, therefore, the work of changing litter, cleaning eggs, etc., is reduced.



Modern, warm, insulated, glass-front laying house. The grain room may be in the center as in this house, or at either end if preferred. The windows may be removed entirely in the summertime.

There are certain facts that should be considered before deciding on the type of house to build, whether open-front (cold house) or insulated (warm house). (Mass. Extension Leaflet No. 145.)

1. Body temperature of fowl at 106 to 107° is higher than that of most other domestic animals.
2. Layers in high production consume or waste at least five gallons of water per 100 birds daily. This moisture must be removed from the house.
3. On an equal weight basis, the hen is provided with eight times as many cubic feet of air inside the house as is the cow. In this respect the poultry house is built to fit the poultryman rather than the hen.
4. Left to herself, a hen will avoid drafts. During periods of high wind, this may be difficult to do in open-front houses.
5. New England weather is variable, to say the least. Changes of 30 or more degrees in 24 hours are not uncommon. Extreme cold and high heat both sap the vitality of layers even more than of growing birds.

6. In many sections of New England, fog makes it even more difficult to properly ventilate the poultry house.
7. Warm air "picks up" moisture from the litter much more readily than does cold air, as shown in the chart below:

Effect of Increasing Temperatures on the Water-holding Capacity of One Cubic foot of Air at 100% Saturation Point

0° F. holds 0.48 grains of moisture										
(a grain is about the size of a wheat kernel)										
30° F.	holds	1.93	grains	or	302%	more	moisture	than	at	zero
50° F.	"	4.07	"	"	751%	"	"	"	"	"
60° F.	"	5.74	"	"	1094%	"	"	"	"	"

(Mass. State College Poultry Dept.)

In other words, at 60° F. the moisture "pick up" of the air is three times as much as at the freezing point.



At only a little expense, much can be done in the way of remodeling an "open-front" house. Here are two views of the same house — before and after.

8. Warming up an uninsulated laying house by restricting the ventilation cannot be done to any appreciable degree without moisture or frost forming on the inside of the roof and on the side walls if the outdoor temperature is much colder than that within the house. This is the result of a natural phenomenon called the "dew point" which is that point where condensation of moisture or frost takes place.

For example, under average New England winter conditions a temperature about 10° F. higher inside an uninsulated laying house than that prevailing

outside will cause moisture or frost to form on the inside of the roof and on the exposed side walls.

In more humid sections, moisture or frost will be more apt to occur than in the drier sections at the same outside temperature.

This is one of the major reasons why poultrymen today are interested in and are constructing insulated houses.

Multiple-story houses and large pens have less outside wall space per bird through which to lose heat.



The Connecticut-type barracks house can be used for brooding or for layers. Note the false front put on when this old building was remodeled. The windows show four stages of opening — from wide open to closed tight. Rain water runs down between two wooden partitions without getting inside the building.

Ventilation

All poultry-house ventilation falls into two classes or types.

1. The open-front uninsulated, or unrestricted ventilation.
2. The insulated, restricted-front adjustment.



OPEN-FRONT ADJUSTMENT

Open-front causes displacement type of circulation. Animal heat leaves room rapidly. Is therefore a cold house in cold weather.



RESTRICTED-FRONT ADJUSTMENT

Restricted-front causes recirculation of animal heat making house warmer. The ideal winter adjustment. Can be opened wide in hot weather. Must be insulated.

MASS. EXTENSION LEAFLET 145

Regardless of type of house used, the front should face in a southerly direction, if possible. No set plan can be prescribed for adjustments of

the windows or curtains according to any formula yet devised. Experience will teach the poultryman how his particular set of ventilation devices will best work.

From June 1 to October 1, it is usually good management to keep the house opened up as much as possible, both front and rear; whereas during the colder eight or nine months of the year, all ventilation is done in the front. Faulty ventilation is not the only reason for wet litter. Construction of the floor may be a factor; type of water dishes



Houses set on posts above ground level should be "closed in" on all four sides during the cold part of the year. In picture above note heavy paper weighted with stones and boards to help prevent cold floors.

and amount of water spilled, and crowded condition of the birds are all to be considered. The system of feeding also affects the condition of the litter. Complete ration feeding and the hopper feeding of scratch grain are both apt to make the litter somewhat more moist than when grain is fed in the litter.



A fully insulated single-story house that gives excellent satisfaction. Sliding curtains on the outside with slot ventilation give adequate air movement without drafts.

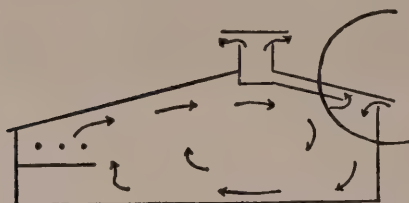
Usually the poultryman is more disturbed by wet litter than is the pen of layers. It is not uncommon to find hens laying long and well in houses that have extremely wet litter. Perhaps the main difficulty with wet litter is the problem of dirty eggs.

Rather than describe here the building or remodeling of a poultry house, or discuss the advantages or disadvantages of different kinds of lumber, types of insulation, etc., it is recommended that any interested New England poultryman secure a free set of Wirthmore Poultry Plans from his nearest Wirthmore dealer or by writing direct to Wirthmore Feeds, Malden, Massachusetts.

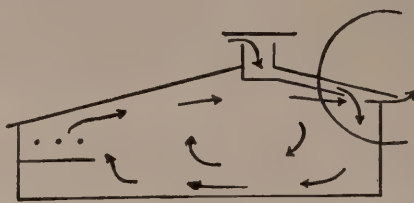
The ventilation of houses with even-span or two-thirds-span roofs can often be helped by installing the Massachusetts extended-flue type of ventilation described and illustrated below:

Massachusetts Extended-flue Type of Ventilation

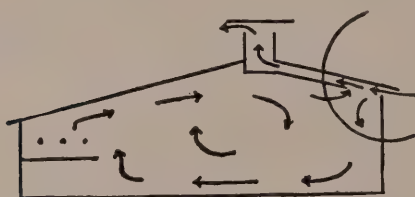
MASS. EXTENSION LEAFLET 145



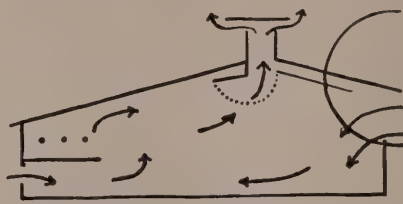
(a) Cold, no wind, maximum recirculation and retention of body heat.



(b) Wind blows down the flue but does not change the circulation.



(c) Hard wind from south short-circuits gap without changing the circulation.



(d) In summer, displacement circulation through trap door keeps house cool.

Details. This extended flue is simple in its construction. One flue to each pen is recommended. The portion of the flue above the roof should be about two feet in height. In length it should be the distance between three rafters, approximately four feet, and in width from 18 to 24 inches. This large size is necessary for maximum benefit in summer, as a large volume of air with its low specific heat-carrying capacity must be drawn out of a house to make much difference inside. On the inside of the house this flue becomes double and extends toward the front plate between three rafters just under the roof. This extended portion of the flue is made by fastening to the under side of the three rafters some plaster board, roofing paper or similar material. This extension of the inside flues goes to within 18 and 36 inches respectively of the front plate.

Directly opposite these extended flue openings at the lower end, the space above the plate in the front wall is left open. All other similar spaces above the plate are closed. The roof over-hang makes these two intakes practically weather proof. It is therefore

apparent that with the short-circuiting principle incorporated in the device the poultryman is prepared for any kind of weather changes. Neither snow nor rain can get in and there will be no great change in the amount of ventilation.

The top of the flue on the roof may have a sheet of insulating board fastened to its under side. The edges of this flue head should extend beyond the vertical sides about one and one-half times the vertical distance of the flue opening. This opening may be made adjustable in size by supporting the top portion with four corner posts that may be raised and lowered and fastened at any one point by means of bolts. This opening may be greatly reduced for winter needs. This method of ventilating a laying house has produced good results.



Above: Front of pen with Mass. extended-flue ventilation.



Below: Close-up of top end of extended flue.



Left: When this building was remodeled, the extended flue was installed and large 10-light sashes were used for windows that slide up and down on outside of front. With a false ceiling, on second floor, this house ventilates splendidly.

Manure Pit

The use of manure pits in place of drop boards has, in recent years, become a common practice. Many advantages are observed when the pits

are used. The drudgery and unpleasant task of daily scraping and cleaning the dropping boards is lessened, and this labor-saving item is of practical advantage. They should be cleaned out once in two months or at least four times per year. Other favorable features of manure pits are the ease with which the pullets can be taught to roost and the cooler roosting quarters provided during the hot weather. The birds use the roosts during the day equally as much as they would the floor space beneath the drop boards. Practical experience seems to indicate that the birds are in a more healthy environment on these roosts than when standing under poorly ventilated, damp dropping boards. Some poultrymen follow the practice of placing mash hoppers on the roosts to maintain or increase feed consumption.



Manure pit in rear of pen. Three-light cellar sashes at the rate of two or three per pen help to ventilate the pen during the summer and help to make pens lighter. The sashes should be at least 18" above the roosts. The best location for them is directly below the rear plate.

Based on sanitation, winter roosting comfort and economy of floor space, there seems to be no disadvantage in using the pits. Scatter a light covering of super-phosphate over the droppings occasionally. Use it all year to:

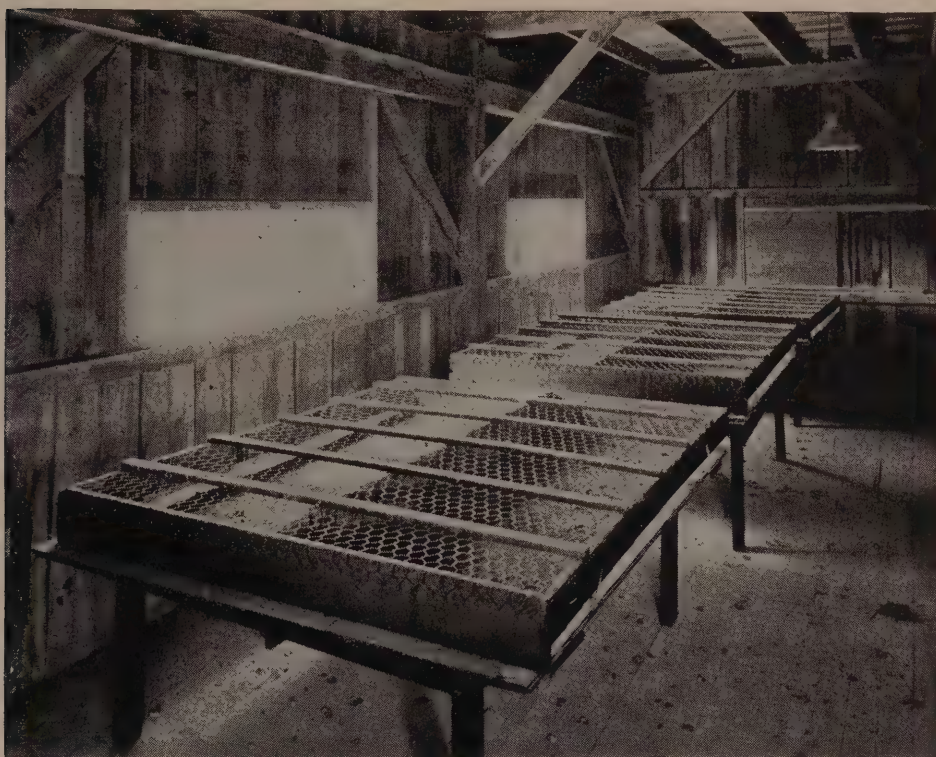
1. Reduce odors.
2. Help in drying out droppings.
3. Help balance fertilizer.
4. Help keep down fly menace during warm weather.

It is best to cover the floor of the pits with two inches of fairly clean, dry litter after each cleaning. A pit four feet wide, extending the full width of a 20' x 20' pen, and five feet wide for a 24' x 24' pen is recommended. It is advisable to have the rear windows two feet or more above the roosts. The roosts should be made of 2" x 2" or preferably 2" x 3"

material. These roosts are usually nailed to a movable frame with $1\frac{1}{2}$ " mesh, 16-gauge wire underneath, as shown in illustration; or with 1" x 2" or 1" x 4" $12\frac{1}{2}$ or 14-gauge welded wire.

Roosts

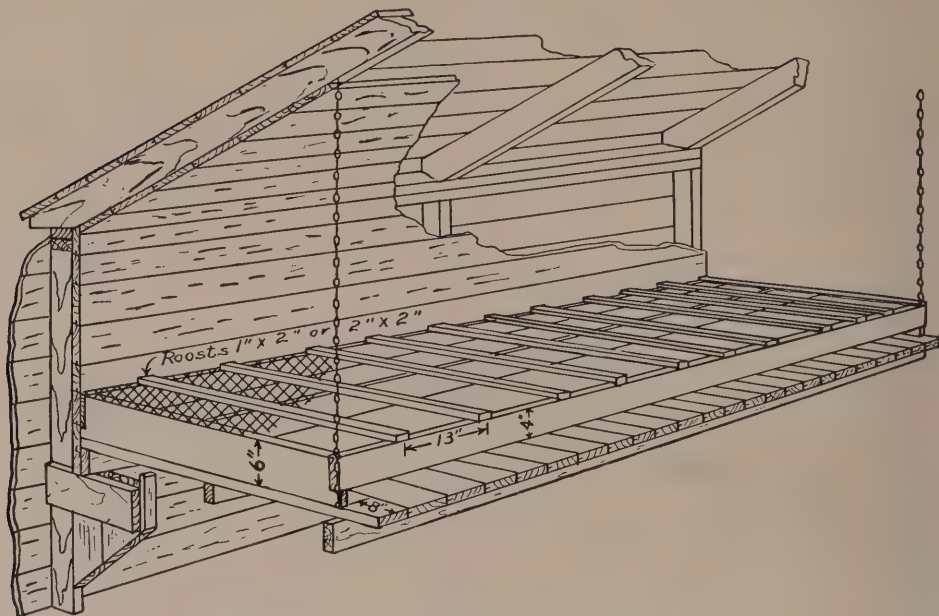
The conventional hinged roost with stationary dropping board is no longer recommended. The dropping board should be movable, built in sections, and so constructed as to permit it to be pulled out a distance of one foot from the rear wall of the house. The circulation of air around the roosting quarters and within the pen is considerably increased when the drop board is pulled out the full distance, thus providing better summer venti-



Note that these roosting tables are set away from the side walls about 2' and permit a good circulation of air at all times. The pen has been used successfully for several years and no difficulty has been experienced with wet litter. The only ventilation is over the rafters in the front or south side of the pen. Plan for building roosting tables is available upon request.

lation and greater comfort for the birds. Pulling the drop board out an inch or two in the winter allows a freer movement of air in the pen. In some instances, this has aided in keeping the pen dry and in reducing litter dampness.

The roost frames should be portable and should be built in sections for easy handling. The perches should be placed crosswise for better utilization of the roosting space. The perches should be spaced not less than



Detail of portable roost and movable dropping board.

13 inches apart on centers, and 14 inches is better. Seven and one-half or eight inches of perch room per bird is the recommended amount for mature stock.

Hoppers

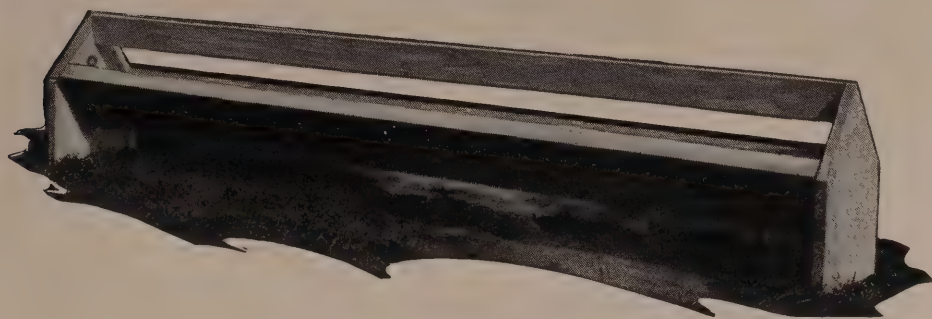
The important features in mash-hopper construction are accessibility to the feed and prevention of waste.

At least three six-foot or two eight-foot hoppers accessible from both sides should be supplied for each 100 birds.



The hopper illustrated on preceding page is easily constructed and is practically non-wasting, unless filled too full. The body of the hopper, and the stand are usually built as one unit, although they may be constructed separately. Six feet is the most common length, due to the convenience in handling and amount of floor space required. The narrow lip along the top sides of the feeding trough helps to prevent the birds from hooking out the feed. The revolving spindle prevents any roosting on the hopper. Having the grit and oyster shells within easy reach of the birds is a desirable feature. An advantage of the low stand called for in this plan is that of having the feed trough as close as possible to the floor without permitting litter to be scratched into it.

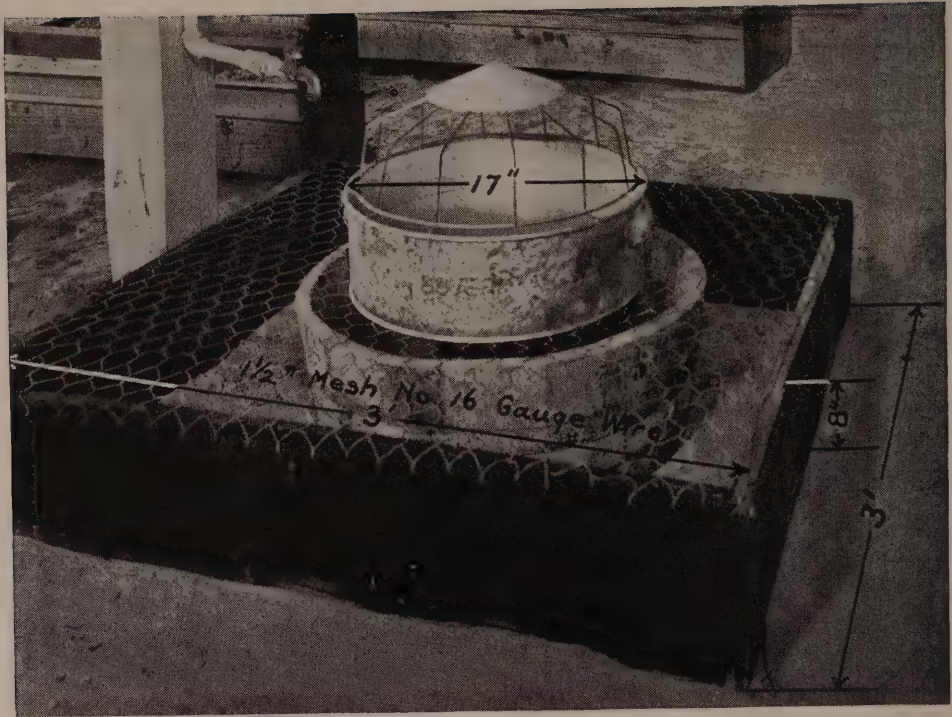
Another satisfactory type is the V-shaped hopper which is easy to build, efficient and economical. It may be built any length suitable to the size of the pen and flock, although it is not desirable to have the sections



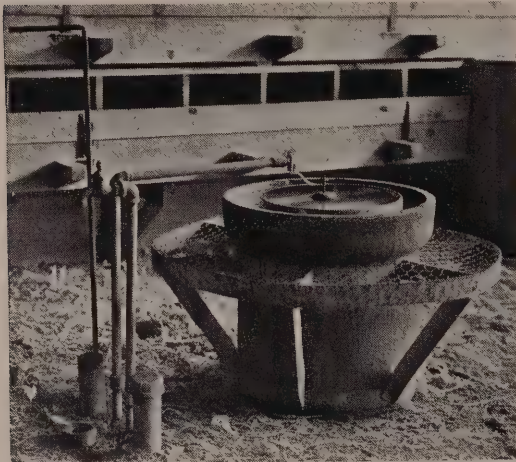
longer than six or eight feet. The V-shaped trough tends to throw the feed together. This makes the feed more accessible when the hopper is nearly empty, and this is an advantage over the flat-bottom type of feeder. The four-inch strip above the feeding trough is free to swing and prevents the birds from roosting and from getting into the feed. This hopper is designed for feeding directly from the floor and no stand is needed.

Waterers

The watering device shown at top of next page has many points of advantage. The water is easily accessible and is kept as clean as possible by means of a wire guard over the top of the pan which prevents the birds from getting into it. The wire platform acts as a support for holding the waterer and keeps the surrounding area clean. A tub or heavy barrel, sawed off at the right height, is placed directly underneath the water pan. The space between the rims of the pan and barrel, at least six inches, catches the water spillage and thus helps to keep the floor dry around the waterer.



The wire platform prevents the birds from coming in contact with any damp or contaminated litter underneath. A galvanized 17-inch refrigerator pan is recommended.

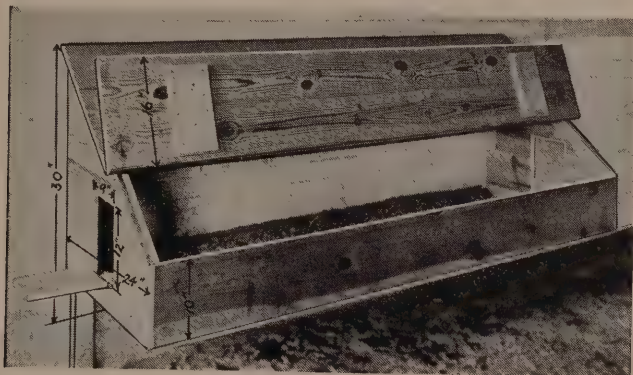


This type of waterer may be operated with an automatic float valve connected to a supply pipe. When so arranged, one such watering device is sufficient for pens up to 150 birds. When running water is not used, at least two water receptacles should be provided where the units consist of more than 100 birds.

Nests

The wall nest carries many desirable features. It is simple and economical to build, easy to clean, compact, requires a minimum amount of wall space, and tends to prevent nest cannibalism, egg breakage and eating of eggs.

If wall area is limited, the nest may be built double-deck. Three decks of nests of this type are seldom satisfactory. No partitions are required. However, some poultrymen prefer to have four-inch partitions spaced 18 inches apart which, in some instances, keep the layers more evenly distributed. It is advisable to have the ten-inch board at the front attached to the nest frame with screws instead of nails so that it may be



removed easily, making it more convenient to thoroughly clean the nest. The bottom of the single-deck nest should be not over 24 inches above the floor of the pen, and the double-deck nest, not over 18 inches above the floor. One six-foot wall nest is sufficient for each 50 layers.

Where individual nests are preferred, they should be 14 to 16 inches square and 12 inches deep, or be built the standard trapnest size. Use one nest for every five birds.

The location of the nests is determined largely by where the roosts are located. If the roosts are in the rear of the pen, the nests are usually placed on one or both sides or ends of the pen. Under no circumstances should they be a part of, and located under, the dropping boards.

Shavings or shredded sugar cane are most popular as nesting materials.

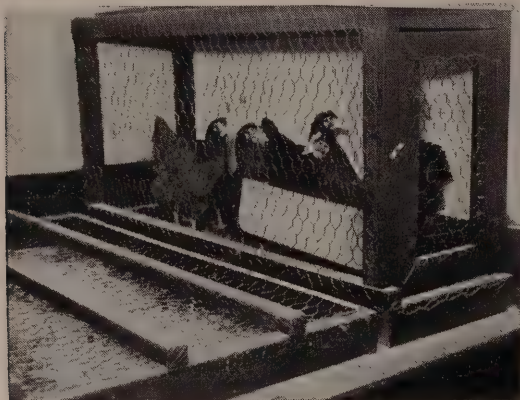
Shell and Grit Feeders

These may be a part of the mash hopper. If not, suitable containers should be supplied so that both are constantly available and easily accessible. Either limestone grit alone, or oyster shells and hard grit may be used.

Broody Coop

Until broodiness is eliminated from hens, a broody coop is a "necessary evil". It should be made largely of wire, be equipped with mash hopper

and waterer and be placed on one of the side walls or in a rear corner, but not directly above the dropping board or pit unless the hens are excluded from that section directly beneath.



Wire floors are used for several reasons: they discourage setting, keep the birds cooler, and are less likely to harbor mites.

Broody birds should be placed in the broody coop as soon as they are noticed and left there for two or three days. A colored leg band should be put on at this time. If it is necessary to confine a bird the second time, a different colored band is placed on her leg. The third time should be the signal for her to be sold.

While in the broody coop, water and laying mash are fed liberally and laying pellets given to encourage feed consumption. Handle the birds carefully.

Preparing the House for the Layers

Regardless of the season of the year that mature pullets are to be housed in their permanent quarters, sufficient time should be taken to clean thoroughly the pens and the equipment in them. They should then be allowed to "air" for at least a week thereafter.

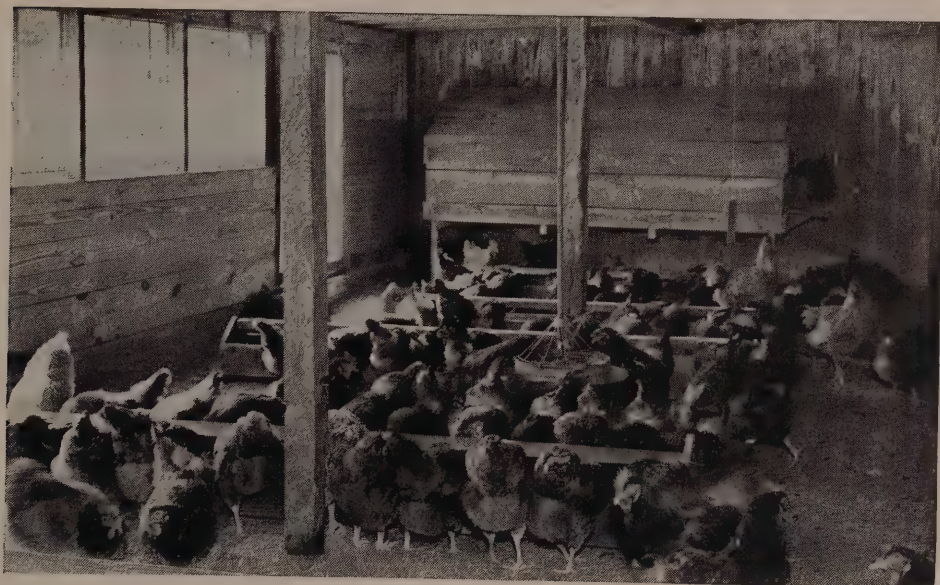
The movable equipment should be cleaned, washed and disinfected and allowed to dry in the sun; the ceiling and walls should be brushed down and all loose dirt shoveled from the floor. After scraping and sweeping all loose dirt from the floor, a hot lye solution should be applied and allowed to soak into and loosen the filth that is fixed to the floor, thus making the job of cleaning less difficult. Occasionally, it may be desirable to let the floor soak for several hours. It is a common practice to wash floors, lower side walls, and dropping boards or pit, with this hot lye solution, which consists of one pound of lye to five gallons of hot water. Spray the walls and ceiling with a good disinfectant and finish up by painting the roosts, dropping boards or pits, wooden nests, broody coops,

etc., with mite destroyer at least a week before the birds are housed. There are many good mite destroyers available such as carbolineum, creosote, gas drip, or crank case oil with 10% crude carbohc acid.

Whitewashing the interior of the laying pens helps to make them lighter and is especially helpful in deep pens and during the shorter days, or in cloudy weather. Whitewash can be made even more of a disinfectant by adding crude carbohc acid (one to two quarts per 50-pound bag of hydrated lime), formaldehyde (three pints diluted into three gallons of water, stirred into whitewash before using), or lime sulphur stockdip, see formula below:

Disinfectant Whitewash: Dissolve five pounds of common salt in two gallons of water. Dilute ten gallons of commercial lime-sulphur mixture with 50 gallons of water and add to this the salt solution. Make a cream of lime by mixing 50 pounds (one sack) of hydrated lime with about ten gallons of water, or by carefully slaking 38 pounds (one-half bushel) of quicklime. Add this to the solution previously prepared, stirring constantly. Thin to desired consistency.

Where only small quantities of the above wash are needed, the following proportions may be used: Dissolve three tablespoonfuls of salt in about one pint of water. Dilute one and one-half quarts of commercial lime-sulphur with about three gallons of water and add the salt solution to this mixture. Make a cream of lime by mixing one heaping quart of hydrated lime with sufficient water. Add the lime mixture to the



A well-planned arrangement of hoppers, waterer and nest. Note that the hoppers and waterer are placed directly on the litter. No jumping necessary to eat or drink.

solution previously prepared, stirring constantly. Thin to desired consistency. (National Lime Association.)

Note: An ounce of alum added to a gallon of lime whitewash lends adhesiveness. A pound of cheap bar soap dissolved in a gallon of boiling water, then added to five gallons of boiling water, and this in turn added to about five gallons of thick whitewash, will give it a gloss like oil paint. (Mass. Poultry Yearbook, 1939).

After the pens have dried out thoroughly, cover floor with one or two inches of sand, or screened gravel, and place the equipment in the proper places. All feed hoppers and waterers should be close to the floor. This is especially true if the pullets come in from the range where they have formed the habit of eating and drinking from low receptacles.

Housing the Pullets

When the pullets reach 10% production, they should be put into the laying pens. There are exceptions to this statement:

1. Early hatched pullets coming into production in hot weather (June and July) may be left on range to advantage, provided the range is in good sod and plenty of good shade is available.
2. Late spring or summer-hatched pullets should be housed during the month of October in most parts of New England, even if they have not reached production.

It is strongly recommended that pullets be housed at night and be placed on the roost — that those of an equal stage of sexual maturity be placed in the same pen; and that only part of the full capacity of the pen be put in at one time. The pullets while on range have been accustomed to plenty of “elbow room” and should be given time to become adjusted to their new home.

It is quite common for range-grown pullets to show real fear of litter and refuse to leave the roosts for some time. To avoid this trouble, use only sand or gravel on the floor for a short time, adding litter gradually after the birds have learned more about their new home.

It is worth repeating that feed hoppers and waterers should be on the floor at this time. Also, place a feed hopper on the roosts for a few days. If waterers cannot be lowered, place one or two extra waterers or pails on the floor.

For a while, at least, try to duplicate as closely as possible the conditions under which the pullets have formerly lived. For example, leave the windows open wide until weather conditions make it necessary to do otherwise.

Handle the pullets carefully to avoid internal ruptures and bruises. While housing them, do a real job of culling or selection. It is useless to

put a cull in the laying house. Space is at more of a premium at this time than it ever will be again. Don't waste it by giving a cull a "break" or a chance.



These four pullets have reached laying age. They are out of the same lot, grown under identical conditions, fed the same ration and photographed at same age. Obviously only two of these four pullets should be housed.

Number of Birds

Size of Pen	Light Breeds	Heavy Breeds
12 x 16	45 to 50	35 to 40
20 x 20	110 to 125	100 to 110
20 x 30	185 to 200	150 to 175
24 x 24	185 to 200	150 to 175
30 x 30	300 to 325	250 to 275
30 x 40	400 to 425	375 to 400

Delousing: While housing the birds and whenever the birds are handled after housing, they should be examined for presence of lice. This is especially important during March, April and May as the weather becomes warmer.

If lice are found, two applications of a lice paint, one week apart, will eliminate them quickly. Pour the lice paint in an oil can (some commercial lice paint comes in a special container) and place one drop every inch on the roost about an hour before the hens go to roost. The heat of the hen's body changes the liquid to a gas which, as it rises through the

feathers, kills the lice. It will not kill lice eggs, however, so a second application a week or ten days later is necessary.

Litter

If a poultry house is properly constructed and the ventilation devices properly manipulated, there should be little difficulty in maintaining dry litter throughout the winter. Little or no litter beyond one or two inches of sand or fine gravel is needed for the summer months.

Use only sand or gravel from date of housing the pullets until cold weather, when litter may be added an inch or two at a time until the

desired depth is reached. This amount varies according to the floor construction and kind of litter. Due to their lower water-absorbing qualities, shavings, straw, sawdust, peanut shells or oat hulls should be six or more inches deep in order to secure absorbent qualities equal to those obtained through the use of three or four inches of peat moss or sugar cane litter.

Stir the litter weekly, or oftener if necessary. This helps to keep it from caking. Except in front of windows and near waterers where the litter must be cleaned out when wet, it should be possible to use the same litter all winter. Wet litter should be cleaned out at once and replaced with dry material to prevent the birds from tracking the dampness over a larger area.



A real labor-saver for a multiple-story house. Used for housing pullets, or for hauling up litter, grain or heavy equipment.

Where old hens are kept over during the summer in the same pens, the dirty litter may be cleaned out in April or May and replaced with a lesser amount for the summer months.

Artificial Lights

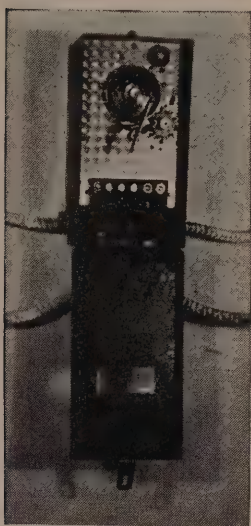
On most commercial poultry plants, artificial lights are "standard equipment". If handled correctly, they are a sound investment.

Experimental evidence shows that the primary result of artificial light is its effect on the glandular activity of the birds in respect to their reproductive organs, thereby stimulating better egg production and

maintaining better health. A secondary result is more feed consumption as a result of a longer feeding day and also as a result of, rather than a cause of, better egg production.

Use one 40-watt lamp for each 200 square feet of floor space or two 40-watt lamps in a 20' x 20' pen. Place the lights about six feet above the mash hoppers and waterers in such a manner that roosting quarters are also lighted. Lights should be equipped with reflectors.

Lights are used all fall and winter on layers in all stages of production and on late-hatched pullets to hasten their maturity. The usual custom is to maintain a 12 to 14-hour day.



A time clock is a labor-saver. Especially necessary when the morning and night light system is used.

January or February-hatched pullets that have laid heavily during June or July should receive lights by August 15 to help prevent a slump or neck molt in the fall.

Yearling hens may be lighted as soon as late July or early August to help them maintain a high summer and fall production. If these yearling hens are to be marketed in the fall, the all-night lighting system may be profitably used.

Automatic devices may be made or purchased to turn the lights off or on. Except for the morning light alone, or the all-night light system, a dimming device is required to get the layers to roost.

There are five systems of lighting used. They are listed in the order of general preference:

1. Morning and evening light: Six a.m. until daylight and from dusk until seven p.m.
2. Morning light only: From three or four o'clock to daylight.
3. Evening lights only: From dusk until nine or ten p.m.
4. Evening lunch: One hour during evening.
5. All-night light: Using a 15-watt lamp instead of 40-watt and having it turned on from dusk until daylight.

As the days lengthen in the spring and the need for artificial lights diminishes, care should be taken not to discontinue their use too abruptly. Reduce the length of time the lights are turned on about ten minutes per day, over a period of one to three weeks. Keep in mind that the feeding day should not be less than when lights were used.

Culling

Culling is a continual process. How often it is done depends on local conditions such as production, market, etc. No cull should remain in the pen from either the sanitary or the economic point of view.



This picture graphically shows the ease with which a flock can be culled at night while the birds are on the roost. Culls are easily noticed and removed. Good culling is an important function in successful poultry production whether it is done in the night or during the day.

MASS. POULTRY YEARBOOK, 1939

A Culling and Selection Chart

FOR JUDGING PRESENT PRODUCTION

<u>Indications</u>	<u>Laying Hen</u>	<u>Nonlaying Hen</u>
Vent	White, large, oblong, moist	Small, round, yellow, dry
Comb	Large, red, full, silky	Small, pale, scaly
Pelvic Bones	Wide apart, pliable	Close together, rigid
Wattles and Earlobes	Prominent, soft	Shrunken, rough, dry

FOR JUDGING PAST PRODUCTION

	<u>Laying, long duration</u>	<u>Laying, short duration</u>
Vent	Bluish white	Flesh-colored
Eye-rings	Thin, edges white	Thick
Eyes	Prominent, sparkling	Listless, sunken, dull
Beak	White	Yellow-tinted
Face	Lean, free from yellow color	Beefy, or hollow, yellowish
Shanks	White, thin, flat	Yellowish, round, full
Plumage	Worn, dry, close-feathered	Smooth, oily, signs of molting, loose-feathered

FOR JUDGING RATE OF PRODUCTION

	<u>High producers</u>	<u>Low producers</u>
Keel	Long, slopes downward	Short, slopes upward
Back	Long, broad, width carried back	Short, narrow
Body	Deep, both front and rear	Shallow
Heart Girth	Wide	Narrow
Capacity (Pelvic bones to keel bone)	Deep (four to five fingers)	Shallow or full of hard fat
Abdomen	Soft, pliable, full	Fatty, hard or contracted
Pelvic Bones	Thin, flat, pliable	Thick, round, rigid
Shanks	Thin, flat, dry	Round, full, smooth
Skin	Loose, thin, soft	Thick, underlaid with fat
Plumage	Close-feathered	Loose-feathered
Comb	Smooth, velvety, full	Shrunk, rough
Head	Deep, flat, wide, width carried well forward	Slopes, long, narrow, beefy
Beak	Broad, short, and stout	Narrow, long and thin
Eyes	Prominent, keen, set well apart	Small, sunken, turning toward beak

Summer Laying Shelters

The summer laying shelter is rapidly gaining deserved popularity. Its most common use is to house the hens during the summer while the winter laying quarters are being prepared for the early hatched pullets. The most common size is 24' x 24' with a yard in which shade should be provided. This shelter will comfortably hold from 300 to 400 birds from early June until late October or early November. An increasingly popular type is the 16' x 18' economy summer laying shelter. This size has a capacity of 200 to 300 birds.

A further use of these shelters is for housing fall or early winter-hatched pullets which are to be kept only for high-priced summer eggs and sold for meat in the fall. On a few farms, the best of these pullets are kept over

Wirthmore 24' x 24' Summer Laying Shelter.



for breeders the following winter and spring. Occasionally in southern New England these shelters are used to grow late-fall broilers after the layers are removed. By building portable wooden or paper sides and ends, these shelters are made fairly comfortable until late into the fall.

During the summer months, excellent egg production can be maintained with very little labor, provided plenty of hopper space and waterers are used. After the hens have been in laying shelters for a week or two, it is not uncommon to find egg production improving to a point above the best average winter yield. Usually, it is not advisable to move layers into



Wirthmore "Economy" 16' x 18' Summer Laying Shelter.

such shelters during July or August, due to danger of throwing them out of production and into a molt. Care should be taken to maintain feed consumption whenever the birds are moved. The use of pellets or a wet mash for a time is usually advisable.

Summer laying shelters make it possible to keep the hens under conditions most favorable for health and production; and, above all, to keep them during the high-priced summer egg season and still be able to do a good cleaning job in the regular laying pens at the poultryman's leisure.

When taking the layers to the shelters, it is advisable to do a good culling job.



A summer laying shelter that is used for growing broilers when not occupied by layers. Sides and ends are covered with heavy paper. A wood-burning brooder stove supplies the heat.

The General Principles of Feeding Laying Birds

Two systems of feeding laying birds are followed:

1. The complete ration or all-mash system.
2. The mash-and-scratch system.

The mash-and-scratch system may be subdivided according to the method of feeding the scratch grain:

- a. Hand feeding of scratch grain.
- b. Hopper feeding of scratch grain.

Regardless of which system is followed it is important to keep up total feed intake. This is essential because with young laying pullets the feed must perform three functions:

1. Provide for body growth until the bird is from 11 to 12 months old, which is usually five to eight months after egg production has started.
2. Supply nutrients for body maintenance.
3. Support egg production at an average rate much beyond that expected of laying birds a few years ago.

In taking care of these three needs, that of increasing body weight to the extent of $\frac{1}{8}$ to $\frac{1}{4}$ pound per month while production is heavy is the most difficult. The amount of feed necessary to do this varies with the breed and the strain. The following table presents data from Cornell University for White Leghorns and production-bred Rhode Island Reds, Plymouth Rocks or New Hampshires:

Pounds of Feed Required Daily by 100 Layers
at Different Rates of Egg Production

% Production	Leghorns	Rocks or Reds
10	19—20 lbs.	24—28 lbs.
20	20—21 "	26—30 "
30	21—22 "	27—31 "
40	22—23 "	28—32 "
50	23—24 "	29—33 "
60	24—25 "	30—35 "
70	25—26 "	32—36 "
80	27—28 "	34—39 "

A drop in feed consumption much below the amounts above indicated will be followed within a few days by a drop in egg production. If this continues for two or three weeks, it will likely result in a drop in body weight and a partial or complete molt.

To avoid this, keep a close check on daily feed consumption, which is easily done when using the clean-up method of feeding. By this is meant the daily feeding of mash and scratch in amounts which the birds will eat in 24 hours.

It is then easy to see when the appetite lags and to take corrective steps and avoid a loss in production.

Weighing birds monthly or even oftener during periods of short days or high production is the best way to check flock condition. Leg-band eight or ten birds in each 100 and use them as a basis for judging the general body condition of the flock.



With either system of feeding there may be times when it is necessary to use one or more of the suggestions below to keep feed intake at the desired level. This is especially true during “peak” production, during the shortening days of fall and winter, and after excessive heat or cold, vaccination or fright.

1. Divide the amount of feed necessary for 24 hours into two or more feedings, or stir up the mash in the hoppers every few hours.
2. If feeding mash and scratch, check the balance between the two. Do not go beyond a 40-60 ratio either way.
3. Maintain a 12 to 14-hour feeding day by use of artificial lights.
4. Feed four to six pounds (three to four quarts) of Wirthmore Laying Pellets to each 100 birds daily.
5. With wet mash — regular laying ration moistened — use four or six quarts daily, or the amount the birds will clean up in from 15 to 20 minutes. Some poultrymen sprinkle the mash in the hoppers with water or milk, but this system should be used with care unless the mash is entirely consumed during the day in hot weather.
6. Place a small hopper on the roost if timid birds have difficulty in eating at the regular hoppers.

Complete Ration System of Feeding Layers

Pullets that have been grown on Wirthmore Complete Growing Ration should be changed to Wirthmore Complete Egg Ration or Wirthmore Complete Laying Ration when production reaches 10%.

If the pullets were grown on growing mash and scratch feed, their mash should be changed immediately but the scratch feed gradually reduced over a period of ten days to two weeks. This reduction of scratch feed will be less noticeable to the birds if mash or pellets are fed at the hour scratch feed formerly was fed. Changing birds that have been fed mash and scratch to the complete ration system after production has started should be done with a reasonable amount of care. It is not advised when birds are laying heavily and have done so for a long period of time, except in the spring when nature favors sustained production. It is particularly inadvisable if the birds are laying heavily and the days are short and the weather cold. Logical times to change from mash and scratch to complete rations are:

1. When birds begin to lay.
2. When they are passing through a molt.
3. When production for other reasons is low.
4. During the natural laying season of spring and early summer.

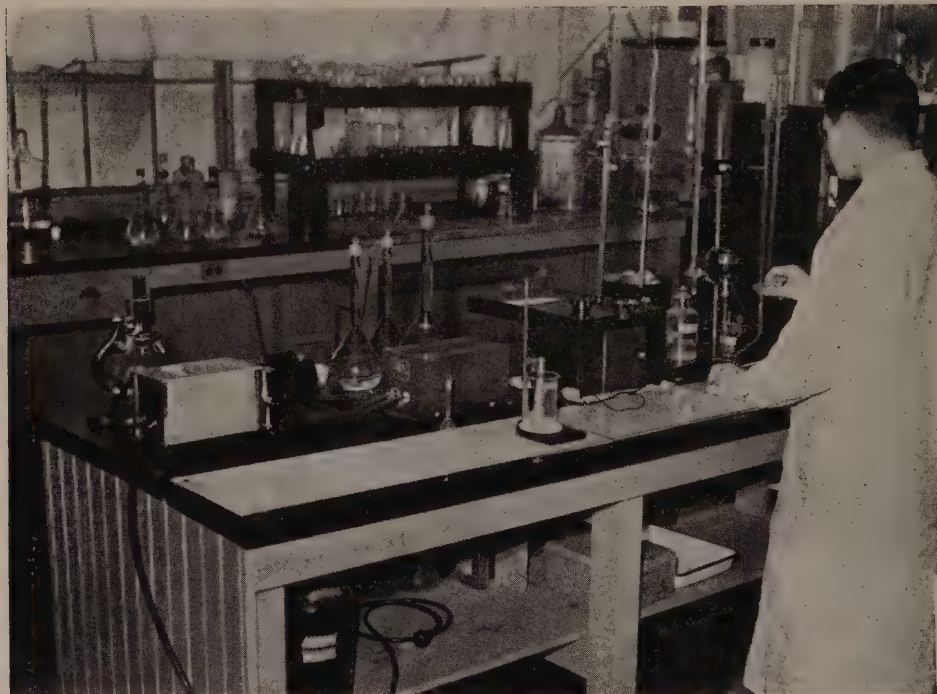
Wirthmore Complete Egg Ration or Wirthmore Complete Laying Ration should be fed daily, placing the amount required for 24 hours in the hoppers once each day. Better appetite and greater feed consumption usually result from this method of feeding.

Which of these complete rations and accompanying pellets should be fed, depends upon whether the eggs are to be used for hatching or for market. If market eggs only are wanted, then Wirthmore Complete Egg Ration is used and, when required, Wirthmore Laying Pellets are also fed. For producing hatching eggs, feed Wirthmore Complete Laying Ration, together with Wirthmore Breeder Pellets whenever the use of pellets is indicated. Wirthmore Laying Pellets or Wirthmore Breeder Pellets are of great value when additional feed consumption is needed. Use from two to four quarts per day (four to six pounds), placing them on top of the mash in the hoppers. Pellets also may be thrown into the litter to encourage the birds to scratch and thus help maintain dry litter.

If moist mash is preferred, use the regular ration moistened to a crumbly stage. Feed four to six quarts daily or the amount that will be cleaned up in 15 or 20 minutes. Place the moist mash on top of the dry ration in the hoppers. Hens will "mix their own" moist mash if the dry feed in the hoppers is wet with water or milk from a sprinkling pot. Care must be taken, however, that the hoppers are cleaned out daily when this method is used in warmer weather.

Pellets or moist mash should be fed in the late afternoon if the mash hoppers are regularly filled in the morning. On the other hand, when the regular feeding is done in the afternoon, then feed the pellets or wet mash

at noontime. Discontinue the use of either pellets or moist mash whenever the birds eat sufficient of the regular ration to care for egg production and body condition.



Measuring "the little things" in nutrition at the Wirthmore Research Laboratory.

Never use scratch grain with Complete Egg Ration or Complete Laying Ration in order to maintain egg production or improve body weight. Protein, mineral and vitamin intake would be reduced by hard grain feeding, whereas they are maintained at the correct level when Wirthmore Laying Pellets or Wirthmore Breeder Pellets are fed.

One exception can be made to the use of some grain in the complete ration system. To encourage scratching and stirring the litter when it tends to become too damp during cold weather, not over one pint of wheat or oats per 100 birds may be fed in the early morning. Throw this grain into the litter where it is most apt to be wet; that is, near the mash hoppers and water receptacles.

The Mash-and-Scratch System of Feeding Layers

There are two ways of feeding scratch feed to birds in the mash-and-scratch system — hand feeding and hopper feeding. In both cases the

mash is hopper fed, placing in the hopper at one time — either morning or late afternoon — the amount that the birds will eat in 24 hours.

Wirthmore Laying Mash is recommended for producers of market eggs only, while Wirthmore Breeder Mash is used by hatching-egg producers.

Hand Feeding of Scratch Feed

When the scratch feed is hand fed, considerable skill is required in determining the amount to feed. The proportions of mash and scratch vary with the breed and strain of bird, date of hatch, age of the bird — whether the layers are pullets or yearlings — and the season of the year.

It should be realized that the purpose of scratch feed is primarily to balance the mash consumption. It is rich in qualities that maintain or increase body weight but does not, like mash, contain needed egg-making nutrients.

Therefore, when production is good but body flesh poor, increase the amount of scratch feed; and when flesh is good but production is poor, decrease the scratch and increase the mash consumption.

Generally speaking, layers, during their pullet year, can consume more scratch feed than they should during their second laying year. More scratch feed is fed during the fall and winter than during the late spring and summer.

It is usually considered good management to keep the proportions of mash and scratch within what is known as the 40-60 ratio; that is, not less than 40% nor over 60% of the day's feed consumption should be scratch feed.

As birds come into production, the amount of scratch feed should be increased in step with increased mash consumption. While no set rule can be laid down, a general guide is to increase the scratch feed one pound per day per hundred layers for each five per cent increase in egg production. For example, if the pullets at 50% production received 14 pounds of scratch feed daily per 100 layers, they should receive 18 pounds per day at 70% production.

When flocks go down in production, the scratch feed allowance should be lowered accordingly, unless the drop in production was caused by the birds becoming too thin in flesh.

The problem with this system of feeding is usually one of maintaining mash intake, rather than getting the birds to eat enough scratch feed.

For this reason the clean-up method of feeding is recommended; that is, give the flock its 24-hour allowance of mash early in the day and allow the hoppers to become empty before the next feeding.

Further aids in this respect are the feeding of fresh mash several times daily, the use of pellets or moist mash, and artificial lights.

Scratch feed, when hand fed, should be given to the birds in the late afternoon, usually about an hour before they go to roost. It is customary, where the scratch feed is not weighed, to feed whatever amount the flock will clean up in that time. If some is left after the birds go to roost, too much was given.

If the birds do not eat enough scratch feed with a single daily feeding, giving them one or two quarts per 100 birds in the morning or at noon will usually accomplish the desired results.

Hopper Feeding Scratch Grain

Free choice of mash, whole or cracked corn and whole oats is practiced to some extent in New England. Mash is fed from one hopper, corn from another and whole oats from a third. Whole wheat should not be hopper fed, but may be hand fed in litter to encourage scratching.

As with all systems of feeding, ample hopper space is essential; not less than three six-foot or two eight-foot hoppers being available to each 100 layers.

To be successful with this method of feeding, it is suggested that the pullets be grown on this system after six to twelve weeks of age, in order to accustom them to it before production starts. Otherwise, too heavy consumption of hard grains is likely to occur with a resultant drop in egg production. With some strains, the occurrence of cannibalism has been a common fault of hopper feeding grain.

When this system is used, it is suggested that some type of anti-cannibalism device, such as pick-guards or "specs", be put on each bird when she is housed to guard against this trouble.

The clean-up method of mash feeding is especially recommended for this system of feeding as mash consumption at times must be encouraged by whatever means possible.

Dividing the day's allowance of mash into two or three feedings, stirring it with the hands several times daily, the use of pellets or moist mash, may all be used to keep up mash intake.

Hopper feeding of both mash and scratch is practical with some strains and breeds, but it has not been as successful with others. It fails where there is a tendency for birds to put on excess fat to the detriment of egg production and hatchability, and with an increased likelihood of outbreaks of cannibalism.

Summer Feeding of Layers

Maintaining high production during the excessive heat of July and August requires skill on the part of the feeder regardless of the system of feeding.

Usually all of the management factors mentioned earlier in this section are necessary to keep up profitable production until late fall.

They include the feeding of dry mash several times daily; use of Wirthmore Laying or Breeder Pellets as the case may be, four to six pounds per day per 100 layers; or moist mash fed once or twice daily at the rate of four to six quarts per day per 100 layers; and at the end of the laying year, the use of artificial lights.

Lights may be used as early as the latter part of July or early August on old birds finishing a year's production. For early hatched pullets, lights should be used by August 15 to 30.

Wirthmore Poultry Flush

At any time during the laying year when the appetites of the birds need toning up or reviving, the use of Wirthmore Poultry Flush is especially helpful. Use it as the entire mash portion of the ration for a period of two days, repeating in one week for another two days, if necessary. It helps a great deal when birds are recovering from any of the infectious respiratory diseases.

Wirthmore Super Pellets

Perhaps most convenient to use when flocks need an appetite "booster" more potent than those regularly adopted are Wirthmore Super Pellets.

Feeding from two to four quarts to each 100 birds for a short period, in addition to their regular ration, is recommended.



One of the heavy-producing White Leghorns at the Wirthmore Demonstration Farm.

OTHER WIRTHMORE PUBLICATIONS of Interest to Poultrymen

BRASS TACKS OF POULTRY KEEPING

A 24-page booklet that presents practical economics for poultry raisers. States clearly the influence of proper breeding, management and feeding on poultry farm earnings.

MONEY-MAKING METHODS OF TURKEY MANAGEMENT

A 28-page illustrated booklet devoted exclusively to management and feeding of turkeys.

Either or both of these publications will be sent free to any New England poultryman. Write direct to Wirthmore Feeds, Malden, Mass.



CAGED BIRDS

STARTING BATTERIES: Battery brooders are used for four general purposes:

1. Displaying day-old chicks and holding "started" chicks in hatcheries.
2. Brooding baby chicks for the first two weeks after which they are transferred to floor brooders.
3. Commercial production of broilers.
4. Growing pullets which will be carried through their entire life in cages.

Commercial poultrymen have made in recent years probably the most notable increase in the use of batteries for brooding chicks. It is because this system of brooding tends to simplify the handling of the starting units for the first two weeks, and is a convenient and rather efficient method of caring for young chicks during the early stages of brooding. This is especially true during cold-weather brooding and periods when



— MANAGEMENT — FEEDING —

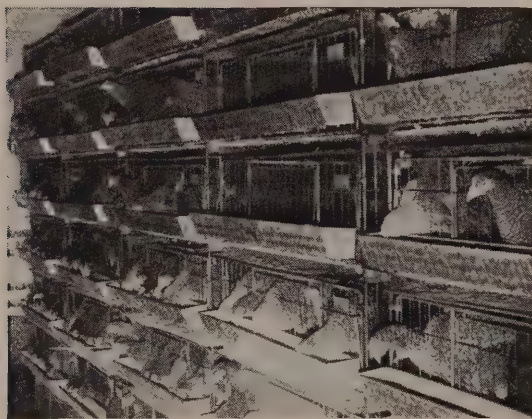
weather conditions are unfavorable. In addition, it offers an opportunity, when the transfer is made to the floor brooders, to grade and cull the chicks.



A chick-starting and broiler-raising plant equipped entirely with batteries.

Battery brooding lends itself to the commercial production of broilers with some degree of efficiency, and producers catering to a fresh-killed broiler trade throughout the year find this system quite well adapted for the purpose.

Growing-and-Developing Batteries



Growing stock at broiler age in batteries.

Birds that are to be battery grown, up to the broiler or roaster age — or until it is time to move the pullets to individual laying cages — are transferred from the starting batteries, after the early brooding stages, to growing-and-developing batteries. Because of their increasing size, this is done to meet their requirements for more floor and feeding space, and also to give them greater head room.

Battery Room Conditions

Successful battery brooding requires a suitable room or building that is properly insulated and ventilated and provided with means for holding temperature and humidity at the desired points. The battery system of brooding makes it possible to carry a larger number of birds with a given floor space than does the floor method. For this reason there should be a greater abundance of fresh air, and the ventilation and humidity requirements should be more precise.

Size of Room

The floor area of the battery room depends largely upon the type and size of batteries to be used, and the number of chicks to be brooded and reared. It is best to allow 30" between units when the feeders and waterers are located at the ends or on three sides of the batteries. A distance of 15" to 18" out from the side walls is sufficient for good air movement. More space should be allowed if the feeding and watering must be done in this space. Have the main aisles at least three feet wide to allow for the removal and cleaning of dropping pans.

Sufficient ceiling height is an essential. A low ceiling means that the cubic air capacity is limited, and with the room full of birds, the air must be circulated so rapidly in order to provide the necessary amount of oxygen and remove offensive odors, that there will undoubtedly be an objectionable draft on some of the chicks. A minimum of 8' in the clear from floor to ceiling is recommended. If the ceiling height is 9' or 10', so much the better, because the higher ceiling is a tremendous advantage during hot weather, since it permits the animal heat from the birds to rise quickly above the batteries and helps to keep the room sufficiently cool for best results. A well-insulated room means that the temperature can be better controlled and extremes more easily avoided.

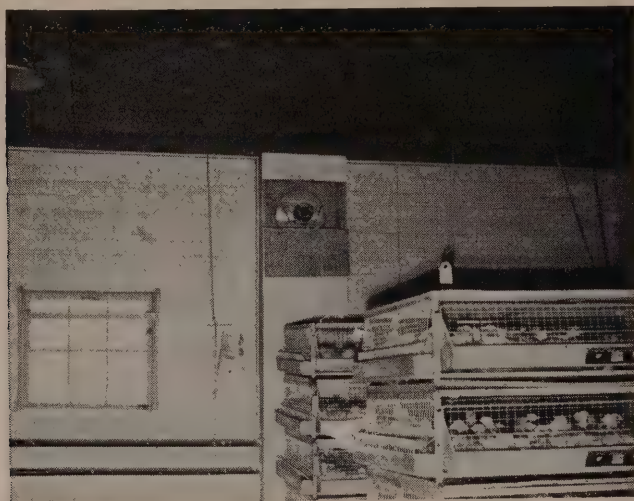
Ventilation

Proper ventilation is essential. A battery room of proper construction, having flues or openings equipped with electric ventilating fans, together with adjustable windows, will, under ordinary conditions, provide adequate ventilation. There are several concerns that manufacture ventilating equipment which can be installed in most any battery room or building.

Humidity

The necessity of providing the correct amount of humidity, especially during the early brooding period, has been recognized as a factor of

major importance in operating a battery plant. Seventy to 75% relative humidity helps to bring about conditions that lessen mortality, improve



Showing exhaust fan located near the ceiling in battery room. The flue in which the fan is placed extends down to within 18" of the floor. This permits the air to be drawn up from near the floor. In hot weather, air from the top of the room can be withdrawn by opening the door in the flue as shown in picture.

feathering and increase growth to a greater degree than when the percentage is carried at a lower level.

Window Space

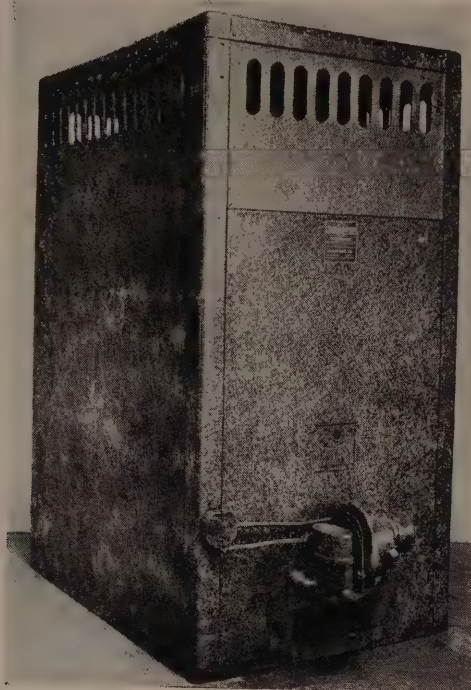
The size and shape of the room and number of battery sections to be used determines, of course, the number of windows required. By placing the windows between the aisles, better light distribution is furnished. Six-light, single-sash windows are commonly used.

Chick-starting rooms should be equipped with only enough light so that the birds can readily see to eat and drink. Not only do too many windows let in too much light, which tends to lead to feather pulling and cannibalism, but they also let in heat during the hot weather. Ample ventilation can be secured through properly arranged flues and ventilators.

Heating

Small installations require only a coal-burning or oil-burning circulating heater equipped with a thermostatically controlled regulator for main-

taining the desired room temperature. When large areas are to be heated, a hot-air unit with a blower type of forced air circulation, or a series of pipes or radiators carrying hot water and placed on at least two side walls, is used successfully. Such heating units should also be equipped with thermostats.



An oil-burning heating unit with circulating fan. Additional moisture may be supplied by means of a moisture pan in the head of this unit.

Selecting Equipment

It is of utmost importance to select equipment that will give several years of satisfactory service. Batteries should be built out of heavy, durable, rust-resisting material. They should be efficient to operate and have roomy compartments. The cleaning devices should be practical and easy to operate. The watering system should be dependable, easy to clean, and should furnish an ample and constant supply of fresh water with a minimum amount of care. Their

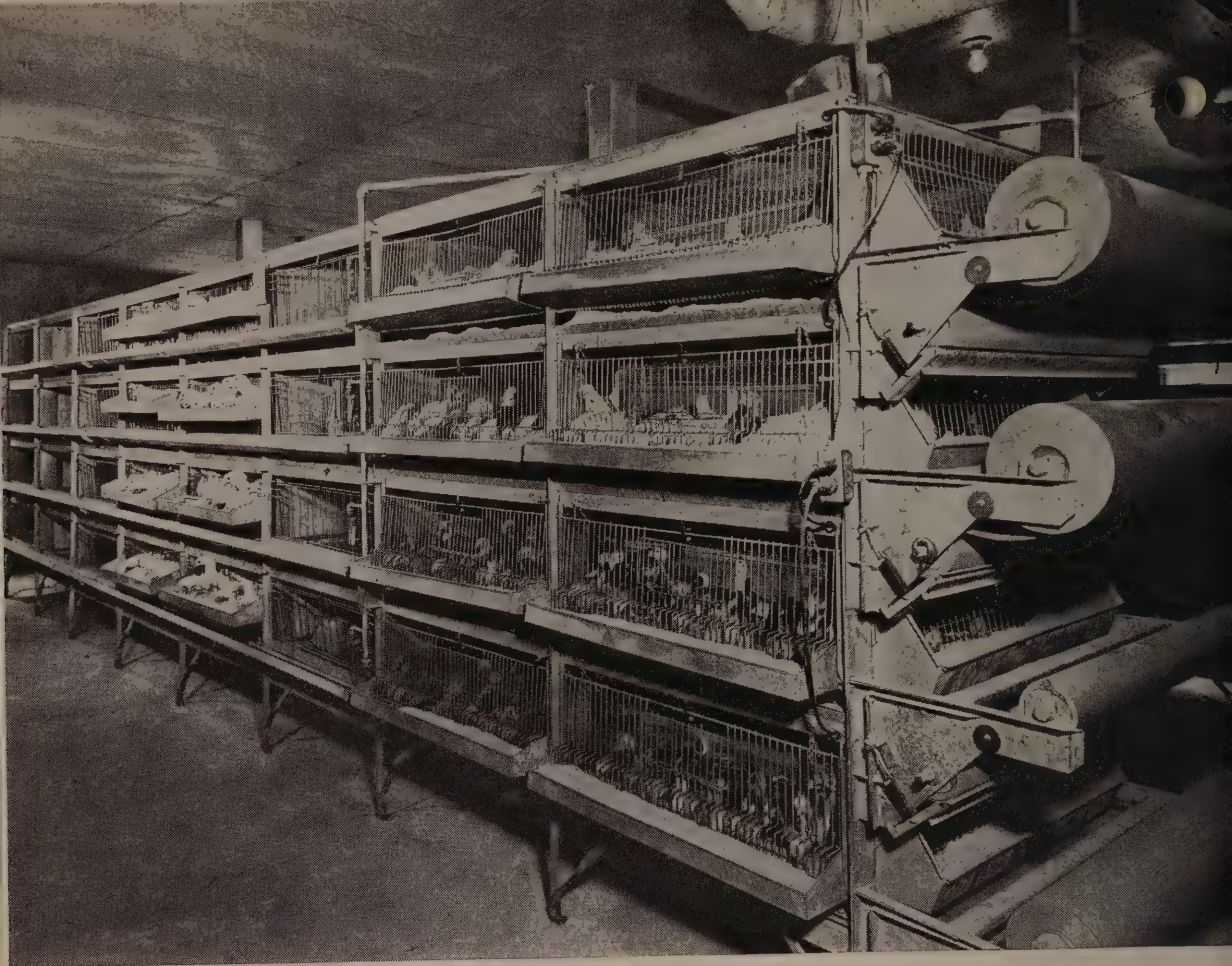
construction should be such as to provide maximum sanitation. The feed troughs should be designed to have the feed easily accessible to the birds, provide sufficient feeding space and be of a non-wasting type.

Starting Batteries

Those equipped with the contact-type of heating units are probably the most desirable. They should supply the desired amount of heat under the hover, even when the room temperature drops to 55 or 60°. Economy of operation is important, and a check-up on the actual consumption of electricity is suggested. Also make sure that the thermostat works accurately.

Growing-and-Developing Batteries

These are not equipped with separate heating units but depend upon room temperature. To meet the requirements, the compartments should be roomy, having sufficient head room so that the birds, as they grow larger, will have plenty of clearance when in a standing position.



Interior view of a chick battery room showing starting and growing units.

Sanitation

The battery room equipment should be kept clean and in a sanitary condition, to keep the birds healthy and contented. The belts, or dropping pans, and the floor should be cleaned regularly to avoid offensive odors and minimize sources for disease germs to propagate. The joints and cracks of batteries make ideal places for mites to harbor. When the batteries are empty, they should be thoroughly cleaned, scrubbed and sprayed with a standard disinfectant, and such pests as mites exterminated from all cracks and crevices by use of a fire gun or blowtorch. Caution: Do not use lice paint on batteries while they are occupied, because of the possible harmful effect upon the birds.

Management of Battery Brooded Chicks

An average room temperature of not over 70° is recommended when starting batteries with heated hovers are used. It should be slowly reduced to 60° by the end of ten days. A hover temperature of 90° at the start is generally considered to be about right, and as the chicks grow older, it should be reduced gradually. The behavior of the chicks determines rather clearly the temperature required. Chicks will huddle

together in an attempt to keep warm when more heat is needed, while on the other hand, if they are comfortable and contented, they will spread out underneath the hover. Too high temperature commonly fosters such vices as feather pulling and cannibalism and retards body development and feather growth.

Maintaining the right amount of relative humidity is considered to be of primary importance in order to promote growth and feathering and lessen mortality. Holding the relative humidity from 70 to 75% in the chick starting room, is the accepted recommendation. A wet bulb hygrometer is a desirable instrument for measuring humidity. To maintain the required humidity, it is sometimes necessary to wet the battery room floor. Excessive dryness in the starting room causes the feathers to become brittle, saps the chicks' vitality, slows body development and gives the birds an unthrifty appearance. Standard equipment should, no doubt, include a thermostatically controlled humidifier.

Overcrowding is a serious mismanagement practice, and the necessity of avoiding it cannot be over-emphasized, because the actual capacity of starting batteries is often over-rated. Crowding birds in batteries reduces floor and hopper space, which subsequently slows their growth, increasing the cost of growing the birds. The cockerels should be separated from the pullets as soon as they can be identified. The pullets are usually removed to the developing batteries at four to eight weeks of age, depending somewhat on the type of equipment used. They should not be held in the starting units too long for the best results.

Fresh-air needs of the battery chicks should be given careful attention, because of the common practice of keeping many more birds per cubic foot than is allowed when floor brooding is followed. Fresh air is essential to the young birds, yet drafts should be avoided as much as possible.

Artificial lighting is needed at various periods of the year and under certain housing conditions. The lights should be arranged so that when in use, the feed troughs and waterers will be well lighted and shadows reduced to a minimum. A feeding period of 12 to 13 hours is commonly sufficient. A longer feeding time is seldom necessary, except in rare cases where birds are to be raised solely for meat production and an abnormally fast growth is desired for a short period. The windows of the battery room are frequently painted with a red-colored compound to overcome too bright daylight. This often acts as a control for feather pulling and cannibalism. Red bulbs are sometimes used for the same reason, when artificial lighting is required.

Feeding Chicks in Batteries

When the chicks are first placed in the batteries, every effort should be made to have the feed easily accessible. Many of the latest models of

batteries are so constructed that the young chicks can readily reach the feed, provided the troughs are kept well filled. In case the chicks have any difficulty in finding the feed, or getting a plentiful supply at the start, scatter some on paper plates, egg case flats or pieces of heavy paper placed on the floor of the brooding unit for two or three days only.

The young chicks should not be allowed to become weakened or stunted because of the lack of sufficient feed and water at the start. If the baby chicks cannot conveniently drink from the regular waterers, place chick-size water fountains on the floor of the battery for the first few days.

Either of two feeding methods may be followed:

1. Keep the feed troughs filled at practically all times but allow the chicks to nearly empty them at least twice a week.
2. Put into the hoppers once or twice daily about as much feed as the chicks will eat before the next feeding period.

Choice of feed for battery raised chicks depends upon whether or not the pullets are to be raised for laying. When that is the objective, Wirthmore Complete Chick Starter & Broiler Ration should be fed until the cockerels and pullets are separated. After separation, continue to feed the pullets Wirthmore Complete Chick Starter & Broiler Ration until they are 8 or 10 weeks old. From then until maturity, feed the pullets Wirthmore Complete Growing Ration. If feed management will not permit the use of a special feeding program for the cockerels after their separation from the pullets, excellent results will be secured by continuing to feed them Wirthmore Complete Chick Starter & Broiler Ration. However, if management permits a separate feeding program for the cockerels, Wirthmore Special Broiler Feed is recommended.

When both cockerels and pullets are to be sold as broilers, Wirthmore Special Broiler Feed has definite advantages for battery broiler production. The advantages of this feed and the manner of using it are fully described under "Specialized Broiler Feeding" on pages 125 to 129.

Some operators prefer to feed battery chicks Wirthmore Baby Chick Scratch for the first two days and then begin using the regular starting ration. Some chick-sized hard grit (mica or granite) should be sprinkled on top of the mash twice weekly. Neither oyster shells nor other calcium material should be fed to chicks in batteries during the growing period.

Management of Battery Grown Pullets

To grow battery-confined pullets to maturity with satisfying results requires suitable equipment, efficient management and proper feeding. This fact is apparent when it is realized that such a flock is being grown under extremely artificial conditions, and is deprived of many of the ad-

vantages usually furnished replacement pullets grown on a good range. With this system of rearing, the birds are very sensitive to faulty feeding practices.

Heating facilities similar to those used, and proved to be satisfactory for laying-cage rooms, are well adapted for this purpose. Holding the room temperature as nearly uniform as possible, is, of course, desirable. When the pullets are first placed in the growing batteries, a room temperature of about 60° is generally recommended. As they advance in age, this should be gradually reduced to 50° whenever possible.

Ventilation demands careful consideration if pullets are to be grown successfully in batteries. As the birds become older, the air should be changed more often in order to induce good feathering, growth and development.

One of the chief difficulties in operating a growing-and-developing battery room during the summer is to keep it cool enough. A reasonably high ceiling is an aid toward helping to keep the room more comfortable in hot weather. This, plus window openings and an electric fan to force the air out through the ventilating shaft, should provide a ventilating system that will give sufficient circulation. In addition, the room or building should be properly insulated for best results. A too rapid flow of hot air at some seasons of the year is to be avoided, as it may lead to serious trouble. A free movement of air without objectionable drafts is most satisfactory.

Guard against overcrowding, because unless the birds are given ample room, the result will be insufficient feed consumption and poor, disappointing growth. Also, as the pullets increase in size, they throw off a greater amount of animal heat, and this, in turn, adds to their discomfort when too many birds are confined to a compartment. An overcrowded growing battery room makes the problem of maintaining a desirable room temperature in hot weather more difficult.

The possibility of the harmful effect on the health of the birds or their production later, as a result of crowding, should also be given consideration.

Holding the relative humidity to 60% or slightly higher, is the approved practice. Usually this can be accomplished by keeping the floor of the battery room wet when needed; or, better still, by the use of a thermostatically controlled humidifier.

The number of birds per unit should be reduced as they grow older and larger, to improve growing conditions and add to their comfort; also,

the weaker individuals should be grouped by themselves and given plenty of room, in order that they will have a better chance to grow.

The same plan of lighting used during the battery brooding period may be followed while the pullets are confined to the growing-and-developing batteries.

The pullets are more flighty and nervous during the growing period than at any other time, and, as a result, are more easily frightened. This causes them to have a tendency to "pile up" and crowd which may retard growth, lead to an outbreak of cannibalism or bring about permanent injury. This seems to occur more frequently when there is too much light in the rearing quarters. The battery room should not be darkened to the extent that the birds cannot readily see to eat and drink.

The transfer from the batteries to the laying-cage units can be made at any time after the battery raised pullets have reached 12 weeks of age up to maturity. When the transfer is not made until the birds are about ready to lay, or are laying, less hen-battery space will be occupied by non-productive individuals, but more developing battery space is required. On the other hand, if changed to laying batteries earlier, the young layers have an opportunity to get accustomed to their new laying quarters before production starts. Some operators believe it is advisable not to transfer pullets to the regular laying cages until they have reached a production of 10 to 15%.

Feeding Pullets Confined in Batteries

The feeding method most commonly followed and best adapted to birds grown in batteries is the complete ration system, because it invariably gives satisfying results. Begin feeding Wirthmore Complete Growing Ration when the pullets are eight to ten weeks of age and continue until production starts, or has reached 10%.

Wirthmore Growing Pellets may be fed in combination with Wirthmore Complete Growing Ration when, for any reason, it is necessary to improve the flesh condition of the pullet flock during the growing period. This is especially true the last month before egg production begins. As a rule, pellet feeding should be gradually discontinued after the body weight or flesh condition has been secured, so that it may be used again later on when needed.

There are two methods of feeding, either of which may be followed; one is to keep the feed troughs well filled with Wirthmore Complete Growing Ration, except to permit the birds to nearly empty them two or three times each week. The other method is to feed the ration in such amounts as will be eaten before the next feeding period. The latter

method has a tendency to produce keener appetites. A small amount of intermediate-size hard grit (mica or granite) should be scattered on top of the mash once each week, but no oyster shells nor other calcium material should be given until approach of maturity. Begin feeding oyster shells and hard grit, or calcite grit alone two to four weeks before laying begins.

Management of Caged Layers

Successful management of caged layers requires experience, close observation of their behavior, and frequent handling of the individual for flesh condition and body weight, in order that any undesirable birds may be detected and removed, and replacements promptly made. Salvaging the unprofitable birds while in a marketable condition and



A modern two-story laying cage house.

replacing them with new recruits, reduces losses from mortality, helps to maintain an equal average egg yield and keeps the plant operating nearer to full capacity.

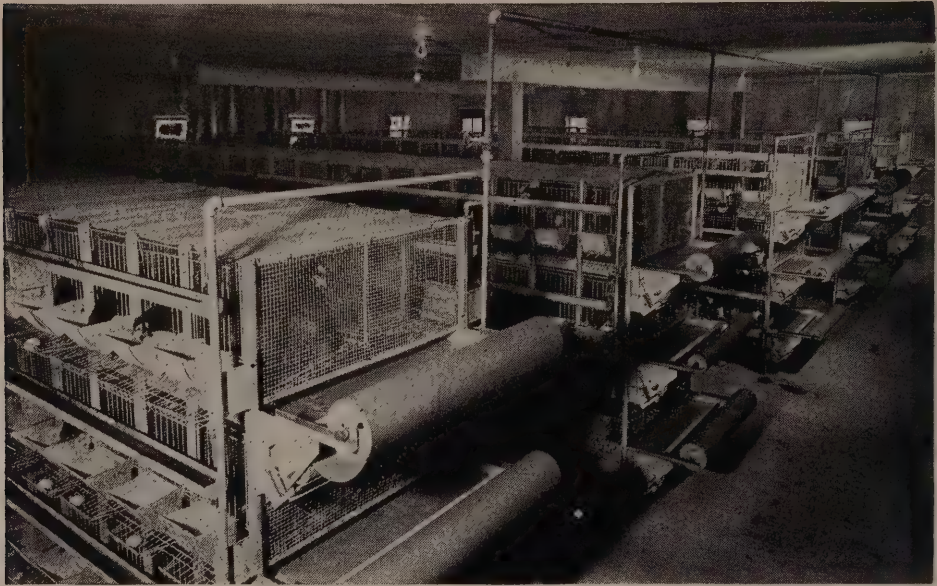
To succeed with caged layers the operator must follow certain fundamental principles. They include the following:

1. Use only strains of birds best suited for the purpose.
2. Have adequate, efficient equipment.
3. Follow skillful management practices.
4. Feed rations especially adapted for birds confined in hen batteries.

Room Temperature

Proper room temperature is decidedly important for best results, and the ideal would be 50° the year around. Keeping the quarters cool enough during the hot weather is often a difficult problem to overcome,

and this point should be given careful attention when constructing the laying-cage rooms. During the winter months when artificial heat is necessary, every effort should be made to keep the cage-room temperature close to 50° F.



Interior view of a caged layer plant showing sections well arranged. Belts are used for catching and removing the droppings.

Ventilation

This is an important part of laying-cage room management and should be watched carefully. The principal reasons are that the adult birds require plenty of fresh air; and with so many birds confined within a comparatively small floor space, the air should be changed frequently; also, because ventilation aids in the control of room temperature.

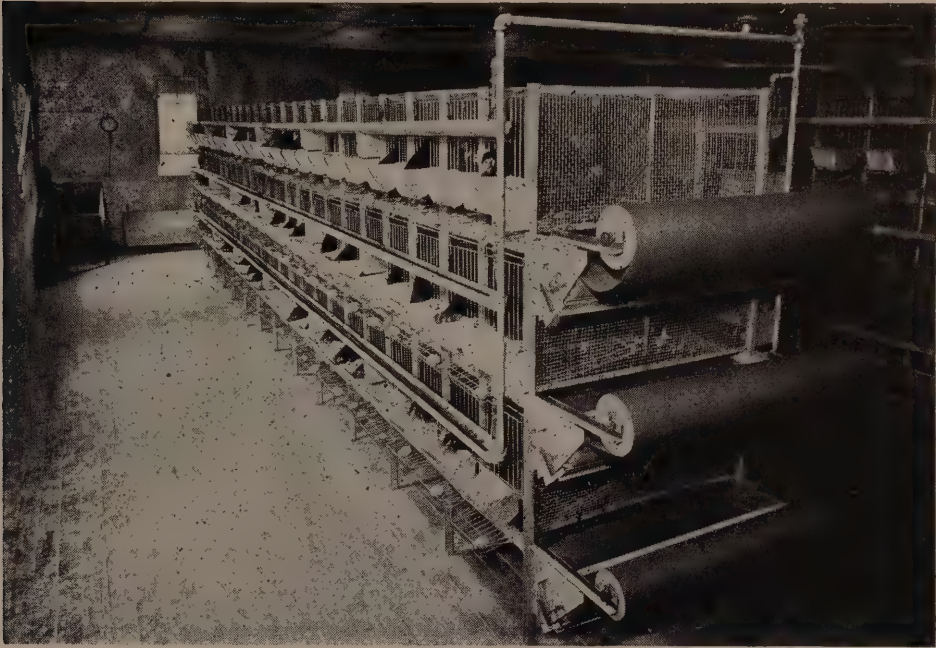
Results may be harmful if the layers are subjected to constant drafts, and one should be guided accordingly when choosing a ventilating system. A few home-made systems, when properly constructed, have worked satisfactorily. There are several good commercially built systems on the market.

Some believe that all, or part, of the windows should be left open for a few minutes once or twice each day, regardless of weather conditions. The assumption is that this plan will bring about a complete change of air within the room.

Heat

In some rooms of moderate size, circulating heaters have proved satisfactory. Satisfying results have been secured when larger areas are to

be heated by placing radiators, or a series of pipes, along the walls on two or three sides of the laying-cage room, using hot water with thermostatic control. Hot-air heating systems with forced-air circulation are used with some installations.



Interior view of a well-lighted laying cage room. The watering trough extends along the front of each compartment.

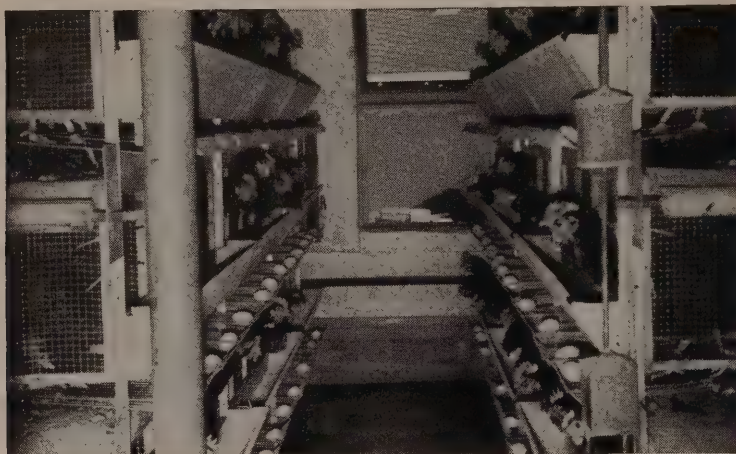
Natural Light

Advantage should be taken of all natural light, so that only a minimum of artificial light will be needed. The windows should be placed exactly opposite the aisles, between the battery sections and at a height so that the top is at least one foot above the top of the cages. Single-sash, 6-light windows are commonly used in narrow rooms, while the 12-light, double-sash type are considered best for large buildings, in order to supply sufficient light for the birds in the bottom decks to see to eat and drink. A good distribution of light is assured by having windows located on opposite sides of the room or building, which also helps to improve the ventilation.

Artificial Lights

These are used when necessary to give the birds a 12 to 13-hour feeding day. The feeding period is sometimes extended to a maximum of 15 hours per day in order to hasten maturing pullets into production, and,

following slumps, in order to increase the rate of laying or to restore production levels. The stimulating effects of brighter lights may produce similar results without extending the lighting period. Any one of



Light should be well distributed in a laying cage room. Double-sash windows are sometimes necessary in wide houses in order to properly light the feed troughs on the bottom decks.

four lighting systems may be used — early morning, evening, morning and evening, or the “night lunch” system, which means putting lights on for an hour anytime between 9:00 p.m. and midnight. All-night lights are seldom advisable.

Replacement Pullets

Those that are about ready to lay should always be available to take the places of those that are constantly being removed, if the laying-cage establishment is to be operated efficiently. This means that a system must be so organized that at regular intervals throughout the year, a flock of baby chicks may be started for the purpose of having a supply of replacement pullets ready when needed. The monthly quota of pullets required for replacement usually runs 10% or less of the total number of caged layers. There are two different plans followed; one is to start a new lot of chicks each month; the other is to have three or four broods each year.

Culling Birds

This is a matter requiring much thought and consideration on the part of the operator, because the basis on which it is to be done must be determined and carefully followed. This includes such items as:

1. Setting up a standard as to the minimum number of eggs a bird should lay per month to assure a profitable annual production.
2. Determining the extent to which culling should be done as related to market demands and prevailing prices of poultry meat.
3. Deciding what length of pause in egg yield justifies the removal of individuals and establishing a rule to follow regarding the advisability of allowing birds to get through a partial molt.

It is understood, of course, that all unhealthy birds, together with those badly out of condition, should be disposed of promptly.



A sturdy, well-constructed laying cage unit. Note the extra-wide droppings belt.

Data Regarding Behavior of Birds in Laying Cages During First Laying Year

		Per Cent Molting											
		Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
Lot No. 1		0	6.2	7.2	13.5	0	2	2	0	0	0	0	0
Lot No. 2		0	16.6	25.0	15.6	0	1	1	0	0	0	0	0

		Per Cent Stopped Laying											
Lot No. 1		0	6.2	7.2	10.4	0	3.1	2	2	5.2	7.2	5.2	3.1
Lot No. 2		0	25	4.1	1	3.1	3.1	2	2	1	2	3.1	3.1

		Per Cent Yield Per Month											
Lot No. 1		45.8	67.7	56.1	46.1	52.1	55.4	67.5	64.8	61.7	57.9	51.0	48.5
Lot No. 2		46.9	42.5	26.1	36.3	57.1	62.1	69.2	67.7	66.5	62.9	58.1	52.9

		Eggs Per Month Per Bird											
Lot No. 1		14.4	21.0	16.8	14.3	16.1	15.5	20.9	19.4	19.2	17.3	15.9	15.0
Lot No. 2		14.1	13.2	7.8	11.2	17.7	17.3	21.5	20.3	20.6	18.9	18.0	16.4

Average production per bird: Lot 1 — 205.8 eggs. Lot 2 — 197 eggs.

Pullets were hatched April 1st — placed in laying cages Sept. 1st.

No culling done — no replacements made.

Note: The above chart, taken from a representative laying cage unit, brings out the fact that groups of bred-to-lay pullets when properly managed and fed during a partial molt, and subsequent pause in production, will recover and make a satisfactory annual egg yield.



A laying cage unit equipped with metal catcher for droppings. The watering tube extends lengthwise through center of each deck.

Feeding Caged Layers

The highly artificial conditions to which caged layers are subjected necessitates rations designed especially for this purpose, if best results are to be obtained. Both Wirthmore Battery Ration and Wirthmore Battery Pellets are compounded to meet the exacting nutritive requirements of birds confined in hen-batteries.

Wirthmore Battery Ration supplies all the needed food elements of caged layers, and only when additional food intake is needed are Wirthmore Battery Pellets essential.

Skillful feeding consists of keeping a close watch of the appetites and body weights of the birds, noting the condition of the droppings and the rate of lay, and observing carefully the behavior of the flock in general. The efficient operator caters to the needs and wants of the birds.

Feeding just about the quantity of Wirthmore Battery Ration that will be eaten before the next feeding time is the suggested practice, as it tends to stimulate the appetites of the layers and avoids an accumulation of stale feed in the troughs. When feed consumption, body weight and flesh condition of the birds indicate the necessity of greater food intake, the feeding of a small quantity of fresh ration more than once a day will often-times accomplish the purpose.

Another way to get the birds to consume more feed is to give them Wirthmore Battery Pellets each day in addition to the regular ration. The amount of pellets fed should not exceed four quarts per 100 birds daily (approximately one ounce per bird per day).

Whenever the need for either or both of these feeding practices no longer exists, they may be gradually discontinued.

When egg production has been held at a high level for an extended period, or after the young adult layers have produced rather heavily for three or four months, the normal tendency is for body weight to drop, followed shortly afterward by a downward swing in egg yield. The timely use of the above-mentioned feeding methods will aid materially in postponing or preventing the loss of body weight and a consequent decline in production.

Oyster shells and grit, or limestone grit alone, should be supplied to caged layers. If oyster shells and grit are used, supply one part grit to three

parts oyster shells. If a cage is supplied with a hopper for these materials, keep a supply of them in the hopper; otherwise, sprinkle these materials on the mash twice weekly.

Several of the pictures in this section of "Timely Topics" were furnished through the courtesy of:

Hubbard Farms, Walpole, N. H.
Macholm Farm, Stamford, Conn.
Davis-Watson Co.
James Mfg. Co.
Shenandoah Equipment Corp.



An attractive and efficient laying cage house.



Better HATCHABILITY

HIGH hatchability goes hand in hand with high quality chicks and is largely influenced by factors definitely under the poultryman's control.

To the producer of market eggs, high hatchability is of no importance except in so far as it reduces the cost of the chicks he buys.

The breeder has a high overhead expense due to the type of work which he is carrying on, and high hatchability means greater financial returns for his labor. A reputation for high hatchability also enhances the sale of his stock.

The commercial hatcheryman, securing hatching eggs from different poultrymen, must get the very best hatches possible in order to meet competition and to increase his business through repeat orders from satisfied customers. And so, today, many hatcheries pay a higher premium for



HOW to SECURE IT

the eggs hatching in the higher percentage ranges as an incentive to poultrymen to produce the very best hatching eggs possible.

New England is just emerging from a "boom" period in the hatching-egg market. For several years, almost any poultryman was able to mate up his flock and sell hatching eggs for the production of broiler chicks. This is no longer true. The supply of hatching eggs is now more plentiful, and hatcherymen have been able to start eliminating those shippers whose eggs have not been giving satisfactory hatches, and hence, chicks of mediocre or poor quality. To stay in this premium market, the producer must do everything in his power to maintain high hatchability. Keeping in mind these various groups, this chapter deals with many factors contributing to high hatches and with some of the more common pitfalls.

Best results are secured through the proper combination of several factors, which are:

1. Breeding.
2. Incubation.
3. Care and handling of hatching eggs.
4. Feeding the breeding flock.
5. Management of the breeders.

Improving Hatchability Through Breeding

Like high egg-production, rate of feathering, and egg size; high hatchability is definitely inherited, and can best be developed or maintained through trapnesting, pedigree breeding and progeny analysis on "primary" breeding farms. The average producer of hatching eggs would do well to secure foundation stock from such breeders, and refresh it every few years by the introduction of fresh stock from such sources. The following program is recommended:

1. Select yearling or older females for vigor and freedom from diseases.
2. Select these females for breed type and characteristics along with normal early feathering and maturity, good body development and freedom from breed disqualifications.
3. Mate the above females to pedigreed males from families which show hatchability of 85% or better.
4. Males must also possess the accepted breed characteristics, and should show an abundance of health and vigor.
5. It can be noted here that the male is the most important factor in determining body shape and type of the offspring; and thus where meat characteristics are desired in the offspring, the male should receive special selection for these qualities.
6. If impossible to obtain pedigreed males of the same strain as the females, a few males should be used on a trial pen before introducing them in the whole flock. Hatchability might be improved by bringing in a new strain, but, at the same time, other good features possessed by the females might be lost through crossing.

Improvement of hatchability through breeding work may be carried on by pedigree breeding and progeny testing of the stock.

Pedigree breeding involves much time and expense, and the average poultryman does not wish to undertake such methods of building up his flock. Instead, such poultrymen find it less expensive and more advisable to take advantage of the work already done by some competent breeder.

Pedigree work to improve hatchability alone would not be advisable. When involved in such a program, the breeder must work with several characteristics rather than one alone, and if not carefully done, may lead to the detriment of the flock rather than improvement. A knowledge of the laws of genetics and their application to poultry is extremely necessary for anyone who plans to undertake such a breeding program.

In inaugurating a pedigree program for the improvement of hatchability, it would be necessary, in addition to the work on other characteristics, to follow some program like the one given below:

1. Select hen breeders which as pullets have shown not less than 95% hatchability.
2. Mate hens in No. 1 to cocks, none of whose previous mates have shown less than 60% hatchability.
3. Later, only cock birds whose daughters have never shown less than 60% hatchability should be used.
4. Eventually, the males should be mated only to hens who never fall below 85% and all of whose daughters equal or exceed 85% hatchability.
5. Mating of hens such as those in No. 1 to cocks from a mating such as No. 4, should give a hatchability of 85% or better for all male breeders.

Hatching may be greatly improved if cockerels from all of the above matings are used on the general flock.

Improving Hatchability Through Incubation

Assuming that an incubator owner is using one of the better-made and more reliable machines, his first approach should be to operate the machine according to recommendations of the manufacturer. Before varying from these recommendations, the operator should give them a thorough trial under his own conditions, as the manufacturer knows best the requirements of his own products, and usually has spent much time and money in determining ideal operating conditions before the machine is placed on the market.

Where old machines are used, one must use his own judgment, after first obtaining all available information regarding similar machines.



Modern incubator installation.

COURTESY HALL BROS. HATCHERY,
WALLINGFORD, CONN.

The following fundamentals of incubator operation are of aid in obtaining best results:

1. Operate machines in well-insulated rooms, or preferably in basements where sudden temperature changes may be avoided.
2. Use properly controlled ventilation, allowing a plentiful supply of fresh air. Auxiliary heat should be available so that a room temperature close to 70° may be constantly maintained.
3. Construct walls and floors to allow for proper sanitation, avoiding cracks, corners and crevices which are difficult to clean and disinfect.
4. Do not operate in the same room with chicks or older birds because of the danger of disease.
5. Following all hatches, immediately remove all accumulated refuse.
6. If the machine is of the cabinet type with the incubating and hatching trays all in one compartment, the down from chicks recently hatched should be removed from the remaining eggs. A vacuum cleaner is of great help.
7. Thoroughly clean and disinfect trays and removable equipment after each hatch. (In separate hatches sanitation is much more easily controlled).
8. After each hatch, fumigate the machines with formaldehyde, in accordance with the manufacturers' recommendations.

A knowledge of embryo mortality, time of hatching, and condition of chicks at hatching time often aids in locating the cause of troubles. Chart on next page gives suggested remedies for the most common causes of poor hatches.

Incubation Chart

SYMPTOMS OF TROUBLE	PROBABLE CAUSES	SUGGESTED REMEDIES
EGGS CLEAR No blood ring or embryo growth.	1. Improper mating. 2. Eggs too old. 3. Breeding hens too thin. 4. Birds too closely confined.	1. Seven to ten vigorous males per 100 hens, depending on age. 2. Eggs set within 14 days after date laid. 3. Keep hens in good flesh.
EGGS CANDLING CLEAR But showing blood or very small embryo on breaking.	1. Incubator temperature too high. 2. Badly chilled eggs. 3. Breeding flock out of condition (frozen combs, chicken pox, etc.). 4. Low-vitamin ration.	1. Watch incubator temperatures. 2. Protect eggs against freezing temperatures. 3. Do not set eggs from birds with frozen combs or with contagious diseases. 4. Feed fish oil and alfalfa*.
DEAD GERMS Embryos dying at from 12 to 18 days.	1. Wrong incubation temperature. 2. Lack of ventilation. 3. Faulty rations.	1. Close temperature regulation. 2. Plenty of fresh air in incubator room and good ventilation of machines. 3. Feed yellow corn, milk, alfalfa meal and fish oil*.
CHICK FULLY FORMED But dead without pipping.	1. Improper turning. 2. Heredity. 3. Wrong temperature.	1. Turn eggs four times daily. 2. Select for high hatchability. 3. Watch incubator temperature.
EGGS PIPPED Chick dead in shell.	1. Low average humidity. 2. Low average temperature. 3. Excessive high temperature for short period.	1. Keep wet bulb temperature from 85 to 90 degrees. 2. Maintain proper temperature throughout hatch. 3. Guard against temperature surge.
STICKY CHICKS Shell sticking to chick.	1. Eggs dried down too much. 2. Low humidity at hatching time.	1. Carry wet bulb temperature of 85 degrees between hatches. 2. Increase wet bulb reading to 88-90 degrees when eggs start pipping.
STICKY CHICKS Chicks smeared with egg contents.	1. Low average temperature. 2. Small air cell due to too high average humidity.	1. Proper operating temperature. 2. Increase ventilation and lower humidity.
ROUGH NAVELS	1. High temperature or wide temperature variations. 2. Low humidity.	1. Careful operation. 2. Proper humidity.
CHICKS TOO SMALL	1. Small eggs. 2. Low humidity. 3. High temperature.	1. Set nothing under 23 oz. eggs. 2. Maintain proper humidity. 3. Watch incubator temperature.
LARGE SOFT-BODIED CHICKS	1. Low average temperature. 2. Poor ventilation.	1. Proper temperature. 2. Adequate ventilation.
MUSHY CHICKS Dead on trays with bad odor.	1. Navel infection in incubator.	1. Careful fumigation of incubator between hatches.
SHORT DOWN ON CHICKS	1. High temperature. 2. Low humidity.	1. Proper temperature. 2. Careful moisture control.
HATCHING TOO EARLY With bloody navels.	1. Temperature too high.	1. Proper control of temperature.
DRAGGY HATCH Some chicks early, but hatch slow in finishing.	1. Temperature too high.	1. Proper operation.
DELAYED HATCH Eggs not starting to pip until 21st day, or later.	1. Average temperature too low.	1. Watch temperatures — check thermometers.
CRIPPLED CHICKS	1. Cross beak—heredity. 2. Missing eye—abnormal. 3. Crooked toes—temperature. 4. Wry neck—not fully known.	1. Careful flock culling. 2. Matter of chance. 3. Watch temperatures. 4. Not fully known.
EXCESSIVE YELLOW COLOR ON CHICKS	1. Too much formaldehyde—fumigation.	1. Follow directions on fumigation program.

Compiled by T. S. Townsley, Director of Research. Smith Incubator Corporation.

* Wirthmore Breeder Ration and Wirthmore Complete Laying Ration are adequately supplied with these ingredients.

Keeping Eggs Hatchable

Many poultrymen who exercise extreme care in the management and feeding of their breeders miss the full reward of their efforts through carelessness in the handling of their hatching eggs. Many an egg when newly laid may be perfect for hatching, but in a few short hours of neglect, the perfect possibilities of that egg may be destroyed.

The rules listed below, if followed closely, will help to maintain hatching eggs in good condition while being held before incubating:

1. Pick up eggs at least three times a day — four to six times in extremely hot or cold weather.
2. Remove the eggs immediately to a moist room with the humidity 85% or higher and holding a temperature between 45° and 55° F. at the level of the eggs, and allow them to cool for 24 hours before packing. Humidity is now generally credited with being highly important in maintaining the keeping qualities of eggs.
3. Use wire baskets — ordinary pails, buckets, and baskets are unsuitable because they reduce the air circulation which is so important in the cooling of the eggs.
4. Candle the eggs, and remove all that show poor shell quality, cracked shells, watery white, broken air cells, or foreign matter such as blood spots and meat spots.
5. Allow the empty egg case to sit in the cool, moist atmosphere of the storage room for several days in order to let flats and fillers draw moisture from the air instead of from the eggs which are later to be packed in them.
6. Do not hold eggs over ten days before shipping, or two weeks before setting. After this time, they rapidly deteriorate and cause slow hatches with increasing embryo mortality. Experimental evidence shows that it is not necessary to turn the eggs if they are to be held only one week.
7. When eggs are to be shipped in extremely cold weather, line the case with several layers of newspapers or with specially prepared sacks.
8. In extremely hot weather, cover the cases with wet blankets while en route to shipping point.
9. Pack eggs with large ends up, on clean flats and on sound fillers. Keep the nests and surroundings clean. Dirty eggs introduce dangerous organisms into the incubator.
10. If necessary to clean eggs, use steel wool or wire brushes.
11. Use a storage room underground, or at least a well-insulated and shaded room above ground. A reasonably high (85% or more) humidity should be maintained. If necessary, sprinkle the floors.
12. Never let hatching eggs get chilled or overheated. Active embryo development starts at 68-69° F. If growth is allowed to start, and is then stopped, high embryo mortality is likely.

EFFECT OF CONTAINER ON COOLING EGGS IN AN EGG ROOM (50° F.)

According to investigations made by Prof. E. M. Funk of the University of Missouri, the type of container affects the rate of cooling eggs very materially.

Hours	Single Egg	Wire Tray	Wire Basket	Galvanized Pail	Chilled Case	Warm Case
0	101.0	102.0	100.0	98.5	97.2	92.0
1	61.1	86.9	96.0	97.9	96.2	91.8
2	51.3	74.4	87.2	95.9	94.5	91.3
3		66.5	79.1	92.2	92.0	90.2
4		61.0	72.7	87.0	89.8	88.6
5		56.5	67.5	82.1	87.5	86.1
10			56.5	65.6	76.5	75.5

At an egg room temperature of 50° a single egg can be cooled below germ development temperature (69°) in one hour; eggs on a wire tray 3 hours; eggs in a wire basket 5 hours; eggs in a galvanized iron pail 10 hours; eggs in a chilled case 18 hours; and eggs in a warm case 20 hours.



Left: The kind of eggs not to set.

Right: The kind of eggs to set.



EFFECT OF AIR CIRCULATION ON COOLING EGGS IN A WIRE BASKET IN AN EGG ROOM (50° F.)

Hours	Still Air Egg Temp. °F.	Circulating Air Egg Temp. °F.
0	100	95.2
1.00	96	55.1
2.00	87.2	50.2

The table above indicates that one hour with circulated air will accomplish more cooling than 12 hours with still air.



Steps of progress in egg collection.

The Relation of Feeding to Hatchability

There would be no feeding problems for the hatching-egg producers to-day if the modern hen lived as did her ancestors of the jungle. From a wild bird which originally laid one or two clutches each of 10 to 15 eggs a year, we have bred an egg-producing machine laying 200, or more, eggs annually.

The wild bird spent practically a year building up her body-reserves of those factors necessary for perfect, or nearly perfect, hatches of healthy, rugged chicks. Today the modern bird is expected, under unnatural conditions, to produce eggs the year around. Even at the most unfavorable times of the year, she is expected to lay eggs which will hatch well and which will start the resulting chicks off with heavy reserves of vitamins and other essential nutrients.

In order to approach desired conditions in a breeding flock, it is necessary to bring it into production with adequate reserves, and then to replenish those reserves as long as hatching eggs are wanted.

The natural bird received her supply of vitamins and nutrients from the sunlight, grains, insects and seeds. During the early years of domestic poultrykeeping, it was observed that breeding birds required four "G's"; namely, "grit, grubs, grain, and greens".

Since the breeding flock was allowed outdoors, the necessity of direct sunlight was overlooked, for the birds had access to it during the season of greens and grubs.

The diet which the mother received exerts a greater influence on the development of a baby chick during its first few days of life than does the diet of the chick itself. If the egg from which the chick hatches contains



a good supply of vitamins and nutrients, the chick draws these factors into its own body. If the supply is low, the chick is handicapped right at the very start, and either does not have strength enough to get out of the shell or gets out and becomes an unthrifty and unsatisfactory individual.

Research and experimental data point out the following important facts:

1. High, sustained production and an adequate ration will not lower hatchability.
2. Proteins (both animal and vegetable) vary widely in value for the breeder ration, depending upon source and method of manufacture.
3. Many vitamins are necessary in the diet of a breeding hen in quantities in excess of those needed for market-egg production alone.
4. Within certain limits, vitamin A increases hatchability in proportion to the amount included in the diet. Eggs of higher hatchability show larger quantities of vitamin A in the yolks than are found in eggs of low hatchability.
5. It is necessary to have more vitamin D in the diet for high hatchability than for market-egg production alone. Low vitamin D content may be reflected in

improper assimilation of calcium and phosphorus by the developing embryo, thus causing poor hatchability. However, an overdose of vitamin D will definitely retard hatchability.

6. Correct mineral balance must be maintained.
7. Increasing amounts of flavin improves hatchability up to a certain level, but beyond this, additional flavin will not increase hatchability. The quantity of flavin needed by breeders is greater than that required for egg production or growth.
8. Vitamin E is necessary for hatchability but is present to the required extent in most rations without the need of special fortification.
9. The addition of manganese in an available form aids hatchability.
10. Breeders on an inadequate diet may produce poor-quality chicks, with little or no reserve of vitamins and other nutrients, thus resulting in poor early growth and high mortality.

Hatchability records made by thousands of flocks fed Wirthmore Breeder Mash or Wirthmore Complete Laying Ration show the effectiveness of applying these nutritive principles to rations soundly designed and tested over a long period of time. The principles of the "four G's" have been incorporated to the advantage of the highly developed breeding industry.

Important Points in Feeding

1. Grow birds on a well-balanced diet right from the start.
2. Use plenty of low feed hoppers in the breeding pens — allowing enough space for all birds to eat at once.
3. Use small feeders on roosts for the more timid birds.



Containers filled with pellets enable the males to get a little extra feed.

4. Provide the cockerels with separate feeding space. Nail troughs or cans onto the walls just out of reach of the females, and keep filled with Wirthmore Breeder Pellets.
5. Use a breeder ration as soon as the pullets reach 10% production.
6. Avoid forcing breeders by such methods as excessive wet mashes, excessive lighting, too high protein feeding without proper balance, etc.
7. Know how much feed is being consumed each day. Constantly check feed intake, body weight, and production.
8. Use Wirthmore Breeder Pellets with either Wirthmore Breeder Mash or Wirthmore Complete Laying Ration whenever increased feed consumption is indicated.



Small hoppers filled with pellets and placed on the roosts help the more timid birds.

9. If the scratch-and-mash system is followed, avoid excessive use of scratch grains.
10. Use the daily clean-up system of feeding if possible.
11. For breeding flocks out of condition because of disease or some other reason, use Wirthmore Super Pellets until the birds are back in shape. Birds affected by colds, coryza or other respiratory troubles will generally produce eggs of poor hatching quality. Feeding Wirthmore Super Pellets will aid in restoring hatching quality.

Management Affects Hatchability

“Condition” of breeding birds is extremely important. Without good body condition, birds are unable to give best results even though they may have inherited the ability to give good hatchability and have access to the best ration available. Proper management is also necessary to maintain “condition”. The poultryman, keeping this in mind, must continually strive to keep the birds in top-notch condition from the time the chicks are put under the brooders until he disposes of them as old birds which have completed their usefulness.

If the poultryman is purchasing his chicks, he should carefully investigate the source. When he has finally decided upon the strain which seems to have most of the characteristics for which he is looking, he begins the important process of brooding and rearing the future breeding stock. For further information regarding the characteristics to look for when purchasing chicks or foundation stock, write Wirthmore Feeds, Malden, Mass., for a free copy of “Brass Tacks of Poultry Keeping”.

It should always be borne in mind that the future breeders, above all, should be allowed to grow normally (without being forced), and kept as free from disease as possible if they are to be brought into the laying house in good condition. For instance, birds which have had severe attacks of coccidiosis, and other diseases, cannot be built up to the point which they might have reached if these troubles had been avoided. Just one out-of-condition male in a breeding flock may reduce hatchability from five to 10% for that mating. Cockerels which have had a severe coccidial infection will give only fair hatchability, regardless of breeding.



These breeding cockerels show **CONDITION**.

When early hatched pullets show signs of neck molting, it is often a good plan to remove the neck molters to a special pen where they may be kept mated and fed specially, to hurry them along and bring them back into production. Hatching-eggs may be saved from such a pen only when production is 40% or better. The rest afforded by a neck molt may be a factor in improving hatchability after the birds come back into production, provided the molt is brought on by a normal course of events. In fact, a few breeders like to see their pullets have a short rest in the late fall or early winter. However, if the rest is brought on because of disease, it is not at all likely to benefit hatchability.

The cockerels from which breeders are to be selected may be raised in small flocks by themselves and not allowed to run with the pullets. The ideal range includes plenty of green feed and the right type of shade.

Piles of brush, grandstands, low bushes, rows of corn or sunflowers help materially to protect the young cockerels. Some of the more timid birds need a chance to escape the "bosses" and if no protection is given, many good birds may be damaged or killed.

The young males should be allowed twice the amount of hopper space necessary for pullets, and hoppers and fountains should be well distributed over the range to give all birds a fair chance to eat and drink. A spacious range and some shelter or concealment is ideal, particularly after the birds get scrappy and begin to drive one another around. It is also desirable to have more roosting space than is recommended for pullets.

Many poultrymen prefer raising a few cockerels with the pullets on range. Five or six cockerels to each shelter of pullets seem to reduce

the fighting among the males and does not affect the pullets. The remaining males to be reared may be grown by themselves in small units.

Poultrymen expecting to sell hatching eggs during the summer months frequently find it advisable to hatch out enough chickens in the fall to give them by June 1 a sufficient supply of November or December-hatched cockerels.

For recommended practices in brooding and rearing, see other sections of this book.

Selection of Pullets and Cockerels for Breeding Purposes

The poultryman should always keep in mind that "like tends to produce like". When selecting pullets for the breeding pens, all birds which are unsatisfactory for any reason should be discarded or not used for breeding



Two pullets of same age. The one at left is a desirable type of breeder; the other is not.

purposes. Only the best should be mated. Breeding from all of the birds raised might lead to disastrous results in the end. If the poultryman raises more than enough birds to fill all his pens and thus allows for a thorough selection, it helps considerably in maintaining good results.

Extreme care in the selection of breeding cockerels for shape and other meat qualities should be exercised because of the males' influence on the type of the offspring.

Cockerels should be culled over several times during the growing period. Selecting the cockerels showing best fleshing at broiler size, helps ma-

terially in getting an ideal bird at the same age among their offspring. Very often a bird may be a fine-looking male at maturity but, unfortunately, because he was of poor type at broiler age, his progeny are apt to show the same fault. At least twice the number of males required should be carried after the selection at broiler age, to allow for further selection.

Any cockerels which do not seem to be developing in good shape should be culled out, along with birds showing disease, lack of vigor, too slow feathering or too slow development. If kept, they might be a total loss through injury by the more vigorous and scrappy birds.

In selecting both males and females, pick birds showing the following points:

1. Vigor and alertness.
2. Large, bright, well-pigmented eye.
3. Good capacity through back and heart girth.
4. Long, straight keel.
5. Fleshy parts of head and face full and deep red.

and reject:

1. All dull-eyed, dull-combed birds.
2. All gray-eyed, or white-shanked birds.
3. Slab-sided, shallow-bodied and poorly built birds.
4. Birds possessing breed disqualifications, or greatly off color for breed.
5. Birds small and poorly developed.

Artificial Insemination

Some progress has been made with artificial insemination, which is the process of securing semen from male birds, and with it, fertilizing the female birds by other than natural means. Work along this line has been done successfully at the United States Department of Agriculture Experiment Station at Beltsville, Maryland, as well as by individual poultrymen, some of whom operate laying-cage installations.

Mating Birds

When the eggs are to be saved for hatching soon after the birds are housed, it is advisable to mate up the birds while still on range to avoid undue disturbances after production begins. It takes from ten days to three weeks to properly establish fertility if both males and females are well matured.

When the cockerels are to go into pens of birds which have been laying heavily for some time, it is recommended that a few males be kept in a crate on the floor of the laying pens for several hours and then released so that the females have a chance to become accustomed to those cockerels

before introduction of the rest of the males, particularly if of different color from the females. The remaining males may be put on the roost at night.

The use of too young males generally means that they will "go to pieces" in the breeding pens and materially lower hatchability after the first few months.

The "Rule of Six" applies well to the American breeds, — "six pounds and six months of age". For the Mediterranean breeds, males should not be used unless they weigh at least five pounds.

It is well to start with seven males to each 100 females where the birds are well graded and selected. This number allows for some culling and mortality. It is often disastrous to add new males to those already established in breeding pens and accustomed to each other.

Where a large number of pens are maintained and where matings probably will not be changed for a long time, extra pens of males should be used. Each month remove a pen of males and substitute one of these extra pens. Males should not be used over six months without at least a month's rest before being used again.

It is well to keep in mind that the use of males which run too large in comparison to the size of the females, often results in lowered hatches. This is more liable to happen in cross breeding than in mating straight breeds.

Changing Matings

When one male or a pen of males is removed from the breeding pens and replaced with a new group, the sperm from the new males will be responsible for almost all of the fertility by the end of the tenth day of mating. This point may be important to the pedigree breeder at times when it is necessary for him to change males. It may also be of importance to the breeder of crosses that do not show color distinction. The breeder of crosses which show color distinction may at times wonder about this, but he may remove one set of males and introduce another set and still continue to hatch. The chicks from the different sets of parents may be distinguished by color as they are removed from the incubators.

Housing

Breeders should never be crowded. Four square feet of floor space, or more, should be allowed each bird, including cockerels. The pens should be light, well-ventilated and dry. Pens ideal from market-egg production standpoint are ideal for the hatching-egg producing flock.

Reconditioning Old Hens

A sound, long-time breeding program requires the use of birds more than one year old. Carrying over these old birds is essential in a program followed by a pedigree breeder, and also for those who wish to raise replacement breeding stock or to supply a demand for chicks from old birds. It is doubtful if more birds should be kept over than is necessary for replacement of the breeder's own flock. Hatcheries generally prefer the extra hatchability and egg quality from the younger birds.

If old birds are carried over, it is well to use both old males and old females. From a breeding standpoint, the older a bird is, the more

valuable it is. Pullets and cockerels hatched from old birds have an advantage of greater livability and health than is generally true of those hatched from flocks which have used cockerels and pullets as breeders for several generations. If the birds have these advantages, it is sure to be reflected in hatchability. The hatchability of the old birds may be slightly less than that from the younger birds, but this factor will not be passed on to the offspring.

Certain practices, if followed, help to maintain a high percentage of hatchability from these older birds. At the end of the laying year the birds tend to molt unevenly. Many



A desirable type of old male to use in improving livability. Offspring of birds of this type possess meat qualities as well as production.

well-bred birds will tend to lay so late that they molt in the cold weather, thus making it difficult to build up their condition before breeding season starts. Yearling birds which are force-molted may be reconditioned and brought back into laying in time to get early hatches of strong chicks. If the flock is allowed to molt normally, it is often difficult to get these early eggs in any quantity.

Moving the old birds out of their laying pens during the first part of the fall season, seems to be an excellent means of rebuilding them. A well-sodded range is particularly desirable. The birds may be put into range shelters, brooder houses or summer shelters.

To get the desired molt, mash feed should be removed and the birds fed sparingly on scratch grains. Often oats are sufficient. As soon as the production has ceased and the molt is well under way, a full feeding program should be resumed.

After the molt, many feeders prefer to use a complete ration in feeding these older birds. It insures a well-balanced diet during the critical stage of molt and also tends to keep the birds in better flesh, as it helps to relieve the danger of too much fat which is so likely to accumulate in old birds fed too heavily on hard grains.

Old birds given a two-months' rest and then returned to the breeding pens should be in excellent condition. A thorough culling should be given the birds when put out, and also before being housed. The only birds kept over should be those demonstrating their ability to lay and come to the end of their year in the best body condition.

Yearling cock birds which are to be kept over should be removed from the breeding pens as soon as the hatching season is over and handled the same as young growing cockerels. Old males may sometimes be spread among the younger cockerels on range. This tends to lessen the fighting and chasing down, among the younger birds, thus helping to raise a greater number of desirable young birds, while reconditioning the older ones.

Old males which have given unsatisfactory fertility and hatchability during their first year should not be kept over. When remating the old males, best results are obtained with a minimum of nine or ten to 100 females for the heavier breeds, and a minimum of eight per 100 for the lighter breeds. Old males should not be used during the summer and fall, however, since they give notoriously poor results outside of the normal breeding season.

Introducing New Stock

If a breeder wishes to introduce new stock, the safest method is the purchase of hatching-eggs or day-old chicks from pullorum-clean sources. Many times older birds from some new source are the means of introducing disease.

Cockerels to be used in breeding pens are generally more satisfactory if raised on the farm where they are to be used, as they seem to build immunity to troubles which may be present on the farm. If introduced as grown birds, they sometimes "go to pieces" rapidly.

If it is necessary to purchase grown stock, all precautions should be observed to avoid introducing carriers of respiratory and other diseases.

Some poultrymen prefer to isolate new stock for at least two weeks in order to avoid an outbreak in the main flock of any troubles which may have been picked up while in transit. This practice will not be of any value in determining whether or not the birds are carriers of some of the infectious diseases from which they have recovered some time previously.

The effects of respiratory troubles of any kind are usually disastrous, and eggs from affected flocks should not be used for hatching purposes during the course of an outbreak, nor until egg quality and production have again reached a normal level.

Use of Lights

It is a common practice to use lights on the breeders and for further details on the use of lights see pages 62 and 63.

Yearling and old birds to be carried over for breeding purposes should not be lighted until it is desirable to bring them into egg production after the fall molt.

The effect of lights does not all lie in increased hours when the birds may eat. Light itself gives some additional stimulation to the sexual organs of the birds.

Hatchability "Do's"

1. Get chicks from high-hatching sources.
2. Keep breeders in good condition.
3. Keep pens dry and comfortable.
4. Remove immediately all diseased or unthrifty birds.
5. Provide an extra group of males for each four or six pens and alternate them to give each group a rest.
6. Provide sunlight through the medium of natural light, open-front pens, wire sun-porches, gravel runs or clean yards that are kept well sodded. Sunlight is free and highly beneficial.
7. Use Wirthmore Breeder Mash or Wirthmore Complete Laying Ration as soon as pullet breeders mature, and continue as long as hatching eggs are wanted. After their molt, put second-year or older breeders on one of these two breeding rations and continue its use throughout their life as breeders.
8. Use Wirthmore Breeder Pellets, when necessary, to improve or maintain body weight.
9. Use Wirthmore Super Pellets to aid the recovery of birds affected by diseases or by other conditions that seriously affect hatchability or chick quality.
10. Keep either granite grit and oyster shells, or limestone grit alone, before the breeders at all times.
11. Keep the birds free from lice and mites.
12. Keep broodiness under control.

13. In pens where production is very poor, separate the better producers from the poorer ones. Place molters and other out-of-condition birds together. Do not save hatching eggs until the birds are in good condition and production is back to 50%.
14. When hatchability drops 5%, immediately let it be a warning that something is wrong.
15. When hatchability drops below 70%, check all hatchability factors.
16. Let it be a warning of a drop in subsequent hatches when poor quality or "pot-bellied" chicks appear.
17. Keep hens from becoming over-fat or excessively thin, thus avoiding lower hatchability.
18. Try to keep production 50% or better.
19. Be sure males and females are mature and healthy.
20. Avoid too few or too many cockerels.
21. Do not use big, clumsy males with active, flighty females.
22. Regulate windows and watch pen temperature to avoid frozen combs and wattles.
23. Check management and feeding methods when neck molts occur.
24. If anti-pick devices are put on while birds are in production, give the birds special attention for a day or two.
25. Feed fresh feed late in the day to encourage a longer feeding day and full crops at roosting time.
26. Avoid sudden temperature changes in incubator room.
27. Pre-warm eggs before setting in machines.
28. Employ strict sanitation in handling all incubator equipment and surroundings.
29. Maintain incubator room at 70° temperature.
30. Provide adequate ventilation in incubator rooms.
31. Stop the laying of birds to be carried over, before they become depleted and have exhausted much of their reserve strength.
32. Place feeders on roosts for timid males and females.
33. The cockerels should be provided with high feeders which are out of reach of the females.

Hatchability "Don'ts"

1. Don't expect high hatchability from poorly raised birds.
2. Don't expect high hatchability from birds in poor body weight. Improve weight first.
3. Don't feed too heavily on scratch feed.
4. Don't allow cannibalism to go unchecked. It has a depressing effect upon hatchability.
5. Don't set or sell eggs for hatching when birds are molting or slumping in production.
6. Don't save eggs for at least two weeks from pens where birds have had their combs badly frosted.
7. Don't forget to pick up eggs several times a day.
8. Don't forget to supply fresh, clean nesting material.

Permanent Success in the Poultry Business—and
Permanent Success in the Feed Business are
Built on the Foundation—rock of *Quality*.



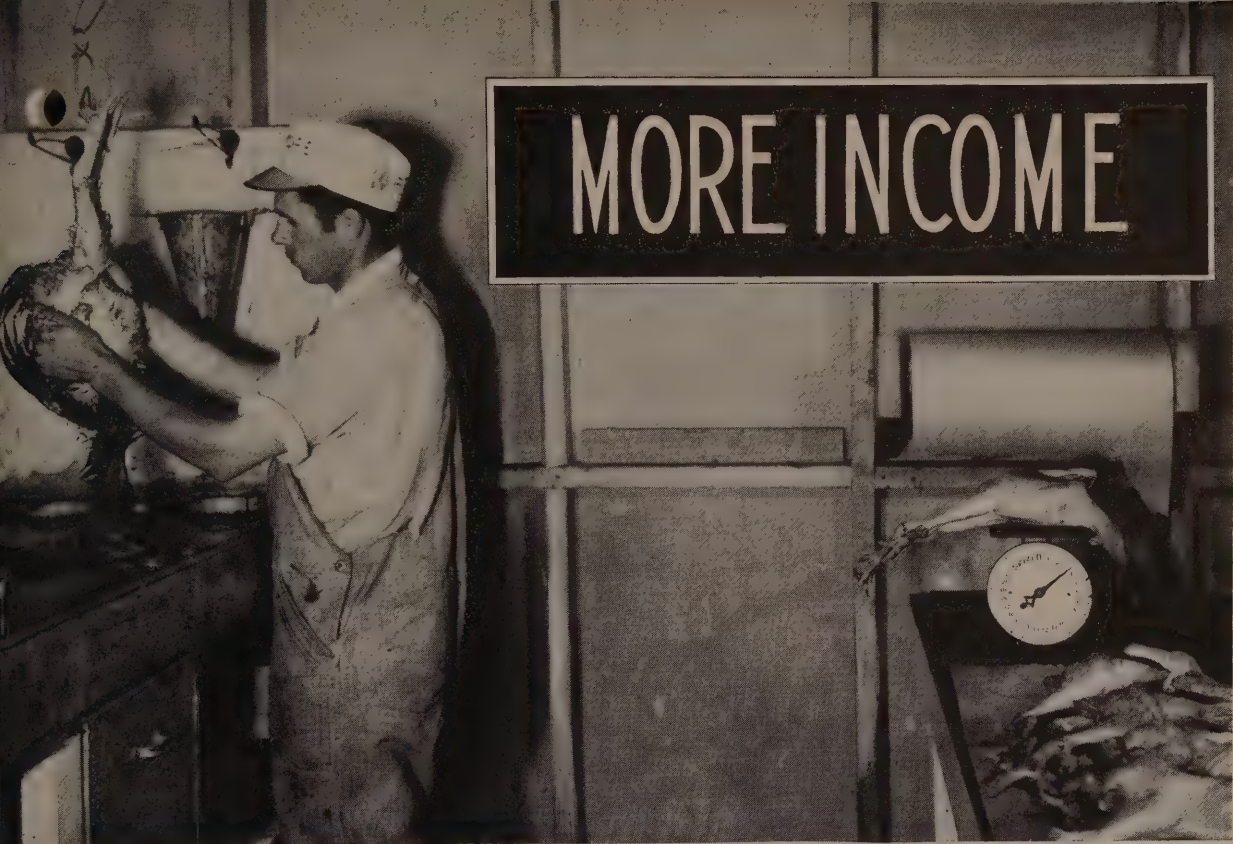
WIRTHMORE POULTRY FEEDS

A New England Quality Product -- made by and for New Englanders

9. Don't wash hatching eggs.
10. Don't hold eggs over ten days if they are to be shipped.
11. Don't forget to cool eggs rapidly.
12. Don't forget the importance of humidity in keeping eggs.
13. Don't use eggs which have thin, porous or ridged shells; watery whites; large air cells; blind checks; meat spots or blood spots.
14. Don't keep the eggs behind the kitchen stove.
15. Don't set eggs which weigh over 30 ounces to the dozen. Best results are generally obtained from eggs not over 28 ounces per dozen.
16. Don't forget importance of range sanitation.
17. Don't introduce a new or strange male in a mated pen.
18. Don't forget to provide ample feeding and watering space at all times.
19. Don't turn eggs after the 18th day of incubation.



"Hatchability".



MORE INCOME

POULTRY meat production in New England is becoming a specialized business within the industry. The tremendous increase in the number of farms specializing in growing birds for meat, indicates that the consumer is becoming quality conscious and is willing to pay a better price for a better product.

New emphasis was also placed upon meat production as a specialized business, following the development and general usage of sexed chicks and sex-linked crossed chicks in New England. Cockerel chicks, formerly regarded as a necessary evil, are now sold to specialized meat producers or growers who sell their product either alive or dressed. Many growers, however, still use straight-run chicks as the pullets generally bring fancy prices for meat, and the additional premium offsets the extra price paid for the pullet chick. Also, the broiler-crossed chicks which are in greatest demand by specialized broiler growers are generally sold straight run.

The development of dressing plants in New England has made it possible for the grower to realize a greater income from meat on the general



from MEAT



A single unit house on a 22,000-bird broiler plant located in New England. Note sand runs, and size of birds. Many are grown to four and five pounds.

market. It has also enabled many poultry meat growers to specialize to a greater extent and devote more of their time to the actual business of growing birds. Many poultry meat growers, however, have developed special markets for their products, and with the increased emphasis which New England is putting upon its development as a recreational center, both winter and summer, it is natural that more and more local markets should become available to the average New England poultryman.

Although poultry meat has always been a by-product on the average New England poultry farm, it is becoming of sufficient importance so



A 10,000-bird broiler house unit on a specialized broiler farm in Delaware.

that those who wish to sell this by-product to advantage should adopt methods used by the specialized grower.

The New England breeder, likewise, should put increasingly greater stress on the meat qualities of his birds and continually reject in the breeding pens those birds which do not have good meat qualities as well as other economic qualities such as egg production, egg quality, etc.



Barred Rock male and female breeders showing excellent meat qualities. They are from a New England breeding flock which is striving to develop meat qualities as well as production in its stock.

New England lends itself well to the development of poultry meat growing:—a cool climate, good quality of stock, freedom from disease,



Growing broilers in shelters is a successful method used on many New England farms.

nearness to special market, and, in many cases, ready access to relatively inexpensive land.

The demand for relatively larger birds— $3\frac{1}{2}$ to 4 pounds—and the inability to successfully grow such larger birds in batteries or other

close confinement and still get top quality, should offer at least certain sections of New England, where low-cost land and housing is available, a real opportunity in growing this type of bird. Increased facilities for transportation make New England as near the big markets, which are year-around outlets, as any other section of the country.

New England had an early lead in specialized meat production, and, at one time, supplied over 90% of the broilers used on the New York market. Much of this leadership was lost through the specialization of



First carload of broilers shipped from New England—1926.

poultrymen in other branches of the poultry industry, such as the production of breeding stock, hatching eggs, etc. The market now demands that all types of birds present a high-quality finish, and this has led to special market preparation, grading and finishing for all birds, whether alive or dressed.

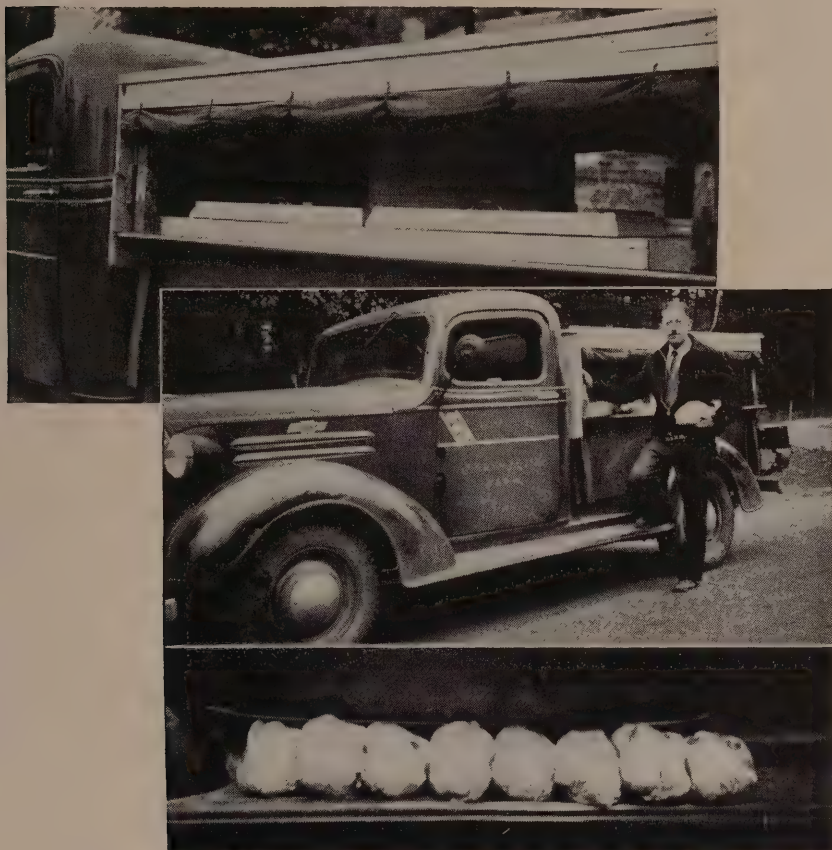
Special Markets

Poultrymen living close to the larger cities and recreational centers are finding it increasingly profitable to cater to the better-class consumer in these sections, with a top-quality bird. Only the best birds are sold on these special markets, and the poor-quality stock shipped to the general market, canned, or prepared in a special manner, such as for use in poultry meat-loaf, individual chicken pies, etc.

It is of utmost importance in maintaining a special market that quality be kept high and no inferior product sold where its identity will be known.

Many poultrymen use special wrapping paper or ribbon markers. Cellophane wrappers add to the appearance of the product and are

becoming more generally used, particularly where birds are sold full-drawn or where sections of birds are sold separately, such as wings, breasts, legs, thighs, etc. This latter type of product will undoubtedly become more and more popular since many consumers will thus be enabled to use chicken by buying the lower-priced cuts.



A special delivery truck used by a New England poultryman in reaching his consumer market. Note the special refrigerator boxes and the cellophane-wrapped birds.

Type of Bird Adapted to Meat Production

The dual type of bird, or heavy breed, which has been so highly developed here in New England, is the type that lends itself well to poultry meat production. Barred Rocks, Rhode Island Reds, New Hampshires, White Rocks and White Wyandottes are the most popular.

Many New England breeders have not kept the dual-purpose objective

too well in mind in developing their strains of birds, letting them become leggy, angular, slab-sided and of a rather poor meat type.



Red and Rock males showing good meat type.



Early feathering and meat type are necessities in producing good meat stock.

For the poultryman who desires to specialize or to derive a considerable source of income from meat production, such factors as meat type,



Good feathering.

rate of growth, feathering, vigor and finish should be considered when buying stock. Good egg production can be obtained from birds of reasonable meat type. At the present time in New England, however, those birds which have the best meat type are generally not the best producers of eggs.

special meat-type birds. Since the shape and type of the offspring in any given mating are largely



A Rock male with highly developed meat qualities.

Crossing of breeds or strains should offer real opportunities for the development of meat-type bird could be obtained by crossing males from a highly established meat-quality line with females which had reasonable meat qualities and highly established egg production. In this manner, egg production, so necessary to the financial success of hatching-egg producers, could be maintained at a high level, and, at the same time, meat qualities would be very apparent in the offspring.

It is possible that different strains of birds, or crosses of strains, may be necessary to meet the needs of the broiler grower and the grower of roasters and capons. Early sexual maturity is desirable for a well-matured, small broiler, but not so desirable for the roaster or capon grower who would like a little later sexual maturity in order to obtain

greater body size. In purchasing stock, the type of market to be met should be kept well in mind.

In buying chicks for poultry-meat production, be sure to check the parent stock for

1. Disease resistance.
2. Rate of growth.
3. Early feathering.
4. Meat type (rounded body short legs; full breast; long, straight keel; light-meated; good skin color).
5. Good finish at market age (eye appeal).
6. Uniformity.

As in market-egg production, it pays real dividends to pay more for stock that has the qualities desired.

Growing Birds for Market

Three classes of poultry are generally grown for market; they are broilers, roasters and capons. A fourth — fowl — is a by-product of egg production and not grown particularly for market purposes.

Broilers

To successfully grow good broilers, poultrymen should purchase the best broiler chicks available and give them every care possible, just as is the



Interior of a special broiler house.

case with replacement stock. Greater numbers of chicks per man must be grown than with replacement stock in order to secure maximum profit, but crowding should be avoided. Enough water receptacles and sufficient feed hoppers equipped with reels to keep the chicks out and a lip to keep the feed in, should be supplied.

A close watch for disease outbreaks should be rigidly maintained. Most broiler men feel that a part of their success is due to their ability to predict disease outbreaks before they occur. A matter of a day or two in discovering trouble where large numbers of broilers are being grown may mean the difference between profit and loss.

Cannibalism should be closely guarded against, and sand runs in front of the brooder houses are recommended to provide extra room and to facilitate growth and feathering.



Long broiler house on Long Island broiler farm.

Specialized broiler raisers, in general, use the long, continuous type of brooder house which is usually divided into rooms which carry from

500 to 1000 broilers each. The houses are generally from 20 to 24 feet deep, and the individual pens, from 20 to 30 feet long. When individual stoves are used for heating, two of them are placed in each pen and from 600 to 800 broiler chicks placed under the two stoves. In some cases continuous hot-water systems are used or a combination of hot-water heat for the room and electric hovers for brooding.

Where the land is well drained and light, floors are often eliminated and sand or gravel used. Sand is replaced every time a new brood of chicks is started. Occasionally in very bad weather other litter is added to the sand in order to maintain a dry condition in the pen, which is highly important to good health in broilers. A continuous track through the building with attached feed carrier to facilitate feeding is recommended.



View of sand runs and broiler houses on a Maine broiler farm.

The houses should be kept cool to encourage feathering, food consumption, rate of growth, and to make for a healthier condition in the birds. Continuous running water should be installed where possible.

Rigid culling should be practiced continually, and any birds that do not measure up to the balance of the flock should be removed immediately and either dressed or destroyed, as such birds are often the means of spreading epidemics among large flocks of broilers.

Floor raising methods seem to be most successful, particularly since the market now demands larger broilers, and $3\frac{1}{2}$ to 4-pound averages are desirable. Much more room must be provided than formerly. Battery blisters are a source of much difficulty to battery broiler men, particularly where the larger-sized birds are grown, and the cost of keeping the larger birds in batteries is considerably higher.

Poultrymen growing larger-sized broilers by floor methods should avoid too narrow roosts in order to prevent blisters. Blisters may be, in some cases, a breeding problem. Most broiler growers do not use roosts but let the birds bed down in the litter and then rake over the litter from day to day.



Broiler chicks being put around the stoves in a typical broiler house.

Broilers should be graded at six or eight weeks of age regardless of whether they are straight run or sexed chicks, and the small birds put



A hinged wire frame used in grading broilers or other poultry on a New England poultry farm.

together, thus giving them a better opportunity to come along. This makes for better uniformity of the flock, and the most uniform flocks receive the best prices. If the broilers are straight run, pullets and cockerels should be separated as well as graded. The pullets are usually kept one or two weeks longer than the cockerels, and premium prices are usually paid for them. The premium on pullet broilers has increased considerably in the past few years because of their eye appeal, both before and after dressing, in spite of the fact that properly grown cockerels show a greater percentage of dressed-out flesh in the carcass than do the pullets.

From the standpoint of feed consumption, broilers to be sold at the lower weights will make the most economical gains, but the larger

birds have a lower cost-per-pound charge for fuel, litter, labor, etc. Many poultrymen grow broilers in New England as a side line between replacement stock seasons. If this can be done without neglecting the replacement stock, it may offer a means of lowering overhead cost or increasing labor efficiency on the general New England poultry farm.

However, many poultrymen growing broilers as a side line feel that such birds can be isolated in rather close quarters without adequate room or ventilation and still do well, but this mistaken idea has been responsible for many of the difficulties which poultrymen have had in trying to realize a profit on broilers.

From a labor standpoint, one man should care for at least 5000 broilers; in many cases, where the buildings are properly laid out and the equip-



One man cares for 10,000 broilers in this house on a specialized broiler farm in Delaware.

ment convenient, one man is caring for as many as 20,000 broilers. This, of course, does not include cleaning, or hauling of feed or water.

Specialized Broiler Feeding

When chickens are raised to broiler age solely for meat purposes, management and feeding may depart to some extent from the more exacting standards followed if they are grown for laying-flock replacement. These changes in management and feeding are made to gain greater economy of production, which is essential when poultry meat is the only source of income because of the relatively narrow margin of profit.

Improper feed and careless brooding are as fatal to profit in broiler raising, however, as in any branch of poultry keeping. Nevertheless,

when the entire brood of chickens is to be sold as broilers, savings may be made in the cost of housing, litter, fuel and labor through a reasonable program of mass production. Likewise, when no thought has to be given to the after-effect of the brooding ration on laying house mortality and egg production, savings may be made in feed costs through the use of a special broiler feed.

Broilers reach marketable size and condition most rapidly and most economically when liberally fed a high-protein ration. Uniformity of feed requirements in broiler flocks makes the use of a single feed mixture for the entire feeding period advisable. This mixture, of course, must provide the different constituents in proper proportions.

For a period before marketing, better carcass finish and still cheaper gains can be secured by feeding finishing pellets or even cracked corn if the special broiler feed has high protein content. This method of specialized broiler feeding is sound because (1) the advantages of high protein are slowly lost as birds grow older; and (2) when meat is the only source of income, the poultryman must definitely attempt to produce superior carcass quality in order to obtain top broiler prices.

In addition to high protein, the special broiler feed should have several other advantages. For economy, broilers are either grown in complete confinement or at least under crowded conditions. Therefore, the special broiler feed must contain cereals in a wider variety and more evenly proportioned than is needed when birds range and eat abundant greenstuff, which offsets a more limited cereal mixture. Enough fiber must be included to discourage the feather-picking and litter-eating tendencies of crowded birds. At the same time, the amount of fiber should be low enough to offset the loss of feed efficiency which is the penalty of too much fiber. Coarseness of texture is another important characteristic. Coarse feed lets birds fill up more rapidly, which speeds up the rate of gain and also lessens hopper crowding. Digestive conditions, moreover, are improved by coarser mixtures. Feed texture has much to do with the moisture content of the droppings. If rightly adjusted, it promotes drier litter, which is a first defense against coccidiosis.

Although a special broiler feed does not need the high vitamin level desired to build reserves in birds grown for laying or breeding, it is essential that it supply enough of all the vitamins known to be required. With the exception of two factors, namely vitamin D and the G complex, the others will be supplied in ample amounts when common ingredients such as grains, mill feeds and protein concentrates are carefully selected on the basis of their vitamin quality, and when such selected ingredients are used in large enough amounts in the feed mixture. Without such selection, vitamin deficiencies, even other than D or G, may be encountered. In any case, a broiler feed must be abundantly fortified with vitamin D in

order to promote sound bone development and rapid growth under adverse seasonal conditions and in confinement. Likewise, vitamin G, at the level needed to make maximum gains from the amount of feed eaten, is a primary necessity.

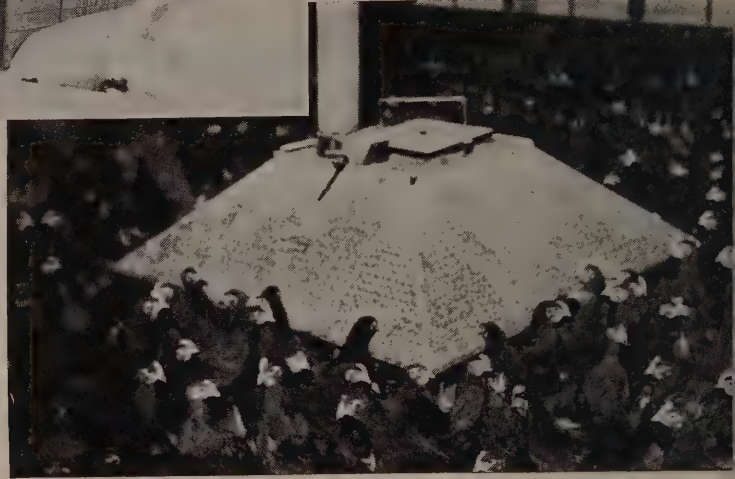
In addition to vitamin D, the successful broiler feed must include enough calcium and phosphorus to build sound legs and straight breast bones. Yet it must avoid those higher levels which lead to slow feathering, excessive framework and poor fleshing, with inferior dressed appearance and unsatisfactory eating quality. Even with proper calcium and phosphorus content, the specialized broiler feed must provide sufficient available manganese to offset the tendency to slipped tendons or perosis, which is a definite hazard of intensive brooding and most marked in some strains of chickens bred for rapid early growth. Also important are other "trace" minerals which promote the redness of comb and wattles that attracts the poultry buyer.

Yellow shanks and skin are of even greater importance than red head parts. Development of yellow color largely depends upon the feed. Yellow corn develops the desired leg color while wheat, oats and barley or their by-products do not. Yellow corn gluten meal is a concentrated source of this factor. For that reason, gluten meal adds greatly to the value of a broiler feed. Green feeds also contain yellow pigment but are impractical to secure in sufficient quantities when large numbers of broilers are raised. Alfalfa meal of high quality is superior to fresh greens in coloring effect. Low-grade alfalfa, cross-bred corn although yellow in color, and gluten meal made from white or mixed corn, all have inferior coloring value. The ability of a special broiler feed to put color into chickens, therefore, depends not only upon the amount of pigment-bearing ingredients but also upon their quality.

Wirthmore Special Broiler Feed meets all requirements for growing high quality broilers, including the advantage of low cost. It is made for chickens raised for meat only. It is not designed for those grown for laying purposes. To start chickens on the road to low laying-house mortality and satisfactory egg production, either Wirthmore Baby Chick Starter or Wirthmore Complete Chick Starter and Broiler Ration should be used.

How to Use Wirthmore Special Broiler Feed

Give Wirthmore Special Broiler Feed to broiler chicks as soon as they are placed in the brooder and continue to feed it until they are marketed.



Winter broilers brooded in boarded-up summer laying shelter.

Sprinkle a small quantity of chick-size granite or mica grit on the mash every other day during the first week. Thereafter, keep it in a hopper where the chickens can eat what they want.

Experimental evidence seems to indicate that insoluble grit not only results in greater gains from the feed eaten, which increases profits, but also lessens trouble from gizzard erosions. Limestone grit or oyster shells, however, should never be fed with Wirthmore Special Broiler Feed because it is designed to supply the proper amount of calcium. Excess calcium from grit or other sources is injurious to bone development, rate of growth and feather quality and can cause cannibalism and slipped tendons.

Restricting the amount of feed eaten cuts down the rate of growth and is false economy. Rapid growth is an important factor in producing broilers cheaply. Fast-growing chickens not only make greater gains than slower-growing birds on the same amount of feed, but also can be sold sooner, making possible additional savings in overhead and labor costs.

To permit unrestricted feed consumption, Wirthmore Special Broiler Feed should be kept in hoppers before the chickens all the time. For the same reason, hopper feeding space should be kept in step with the growing demands of the flock. Feed consumption is stimulated by putting no more than one day's supply in the hoppers. It is further encouraged by adding and stirring in a little fresh feed several times daily. Although

the feed hoppers should never be empty for long, skilled broiler raisers gauge the amount fed so that the birds clean out the hoppers once each day. When days are short, or the houses for other reasons are dark, lengthening the feeding day to 14 hours by artificial light will help make faster gains. Twenty-four hour feeding under bright lights rarely proves successful and is not advised.

According to rapidity of growth, which varies with the strain of the chickens and the skill of brooding, broilers fed Wirthmore Special Broiler Feed should be ready for finish feeding at eight or ten weeks of age. No earlier than eight weeks if growth has been rapid, and no later than ten weeks in any case, feed Wirthmore Finishing Pellets or cracked yellow corn in addition to Wirthmore Special Broiler Feed. The simplest, most satisfactory way is to keep either pellets or cracked corn in hoppers before the chickens. Feeding either one on top of the broiler feed may result in mash "hooking" and waste. Two hoppers for the broiler feed and one for the pellets or cracked corn is a good proportion. When Wirthmore Finishing Pellets or cracked corn and Wirthmore Special Broiler Feed are kept before broilers after they are eight or ten weeks old, they will balance the amounts of each consumed to meet their needs until marketed.

Whether to use Wirthmore Finishing Pellets or yellow cracked corn with Wirthmore Special Broiler Feed depends upon both the characteristics of the strain and the condition of the broilers. Slow-growing strains and those with poor fleshing tendencies will finish better if fed pellets. Strains that grow rapidly and take on meat readily may be fed cracked corn during the finishing period. If chickens of good broiler type are in poor flesh when they reach finishing age, pellets will give better results than cracked corn. Due to their composition, Wirthmore Finishing Pellets will "throw" *shank* color equal to cracked corn.

Flushing Broiler Chickens

Dry litter is an important factor in the prevention of coccidiosis outbreaks. Any practice leading to damp litter, therefore, is a serious menace to successful control of this disease. The improper use of any kind of flush, although recommended for the control of coccidiosis, may make the situation worse. This is particularly true in broiler raising, where brooder houses and yards are usually crowded, where new chicks follow closely after marketing previous lots and where chicks of susceptible age are usually kept close to older ones which, although not visibly sick, are a source of this infection.

The use of either Epsom salts or a milk flush will not prevent coccidiosis. If either is used, it should only be after signs of the disease are seen.

The dosage should promote a prompt response, cleaning out the intestinal tract within 24 hours, but should not cause several days of very wet droppings. As soon as the effect of the flush is over, the old litter should be replaced with dry. Continuous flushing and imprudent preventive flushing slow down broiler growth and set the stage for serious coccidiosis outbreaks.

Roasters

Roasters have increased in demand everywhere because housewives have found them an economical source of good poultry meat. As with broilers, it pays to buy good stock from a strain well suited to development as roasters. Birds coming from stock which is not too early in sexual maturity make the largest roasters; otherwise, the type of bird adapted to good broiler growth is well adapted to roaster growing.

Where the growing of roasters is a side line to the growing of replacement pullets, stock which has had selection along desirable meat-quality lines is preferable. Where this factor is considered and proper attention given to growing the birds, roasters make an excellent side line to pullet growing. In fact, in some sections of New England, pullet growing has become a side line to roaster growing, because some poultrymen have found a greater profit in growing roasters for market, and a more ready market than in growing pullets.



Ideal range for growing good roasters with a minimum loss.

Good roasters can be grown here in New England during the spring, summer and fall months by putting them out in shelters and growing them just as good replacement pullets are grown. To grow good roasters successfully, plenty of shade should be available, and large open ranges

should be avoided. Bushy land with plenty of opportunity provided for the birds to get away from each other has proved excellent. Grandstands and wire or bush divisional fences are recommended. Where



Growing roasters housed in range shelters on a Maine farm.

permanent shade is not available, corn and sun flowers that are sowed early in the spring, alternating wide rows of sod with wide rows of corn and sun flowers, make a nearly ideal environment.

Feed and water should be spread out in many different sections of the range to avoid "bossism".

Shelter houses should be set as far apart as convenience and practical management dictate, the cockerels being housed in as small a unit as possible; 75 birds to a shelter, for instance, is better than 100. More shelters and less birds per shelter is a better rule. Roosts in the shelters should be wide and flat to avoid blisters on the breasts of the finished birds.

Culls or birds that are driven by others, or extremely slow-developing individuals should be removed to a separate range provided for them. When placed by themselves in this manner, some will develop. Those that are definitely poor individuals should be disposed of at once.

Roasters should be sold just as they reach maturity, and before they become staggy. Many poultrymen make the mistake of trying to finish roasters before they have reached sexual maturity. Much experimental work has determined that roasters do not lend themselves to finishing methods until sexual maturity has been reached. It is natural for birds to be gawky and angular while developing. Sexual maturity brings the roundness necessary for good market condition.

Where fighting has become serious and cannot be controlled by other methods, some poultrymen have found that anti-pick devices, which are mechanical metal objects applied to the head of the bird, and which can be easily obtained, are helpful.

Feeding Roasters When Raising Layers

"Roasting chickens" in most instances are a by-product where pullets are grown for laying. In this case rations designed to give the pullets a proper start must be used through the brooding period. Such rations are Wirthmore Baby Chick Starter followed by Wirthmore Growing Mash with scratch grain; and Wirthmore Complete Chick Starter and Broiler Ration. For the good of both pullets and cockerels they should be separated when six weeks old. This permits special feeding of the cockerels to bring them to roaster size, $5\frac{1}{2}$ to 6 pounds live weight, in the shortest possible time and with the greatest economy.

After separation from the pullets and until these future "roasting chickens" are eight to ten weeks old, their only feed should be Wirthmore Special Broiler Feed. After they are eight to ten weeks old, feed yellow cracked corn in addition, changing to whole corn when it can be eaten. The continued use of this simple feeding program will frequently produce marketable roasters at 16 to 20 weeks of age. Management and breeding greatly affect the age when weight and finish meet market demands. If two or three weeks before marketing the roasters lack finish, give them all the Wirthmore Finishing Pellets they will eat in addition to corn and Special Broiler Feed. Granite or mica grit should be constantly available. Limestone grit or oyster shells should not be fed to "roasting chickens" since excess calcium interferes with their best development.

In raising "roasting chickens" unrestricted feed consumption leads to the most rapid growth and most economical gains. Putting fresh mash and grain daily into hoppers with ample feeding frontage aids in this. Hand-feeding corn on clean ground or litter late in the afternoon gets extra feed into roasters to good effect. This is in addition to the grain and mash kept before them at all times. The cockerels will eat much more corn than mash as they grow older, which is a desirable feature of raising roasters on Wirthmore Special Broiler Feed.

It is not always convenient to carry cockerels to roaster size by a feeding system different from that used for the pullets. In that case, efficient results can be secured by feeding either Wirthmore Complete Growing Ration or Wirthmore Growing Mash and scratch grain, whichever system is being used for the pullets. Where either of these growing mashes are used, superior market qualities will be gained by liberally feeding Wirthmore Finishing Pellets for three weeks before the roasters

are sold. Hopper feeding Wirthmore Growing Pellets with Wirthmore Complete Growing Ration after the cockerels are 12 weeks old and until Finishing Pellets are fed produces excellent roasters.

Feeding Roasters When Meat Only is the Goal

Some poultrymen specialize in raising chickens, including pullets, for only one purpose; namely, to sell as roasters. Such chickens can be fed with satisfaction and economy Wirthmore Special Broiler Feed, both as a starting and growing feed. It is one of the simplest ways of feeding roasters. After the first eight weeks cracked corn should be fed in addition to Wirthmore Special Broiler Feed. Whole corn is used as soon as the birds can eat it. Free choice hopper feeding should be practiced from start to finish. From eight weeks until the roasters are ready for market, increasing quantities of corn will be eaten as the birds balance their ration. Due to high protein content and other favorable characteristics of Wirthmore Special Broiler Feed, this system results in rapid growth to roaster size with low feed costs.

To secure superior carcass quality, Wirthmore Finishing Pellets should be hopper fed in addition to the broiler feed and cracked corn for three weeks before marketing. Abundant hopper space and daily feeding leads to the most efficient feed utilization, earlier marketing and more economical gains.

Capons

Caponizing birds to obtain a better market price has gained some favor. Capons make a softer, juicier meat. They do not make as economical



Specialized capon growing on a Maine poultry farm. Two thousand capons on this range, housed in small shelters.

growth as roasters up to the time the roaster reaches sexual maturity, but they continue to grow and put on extra weight after the roaster has

stopped growing. They do not become staggy and, when properly grown, may be sold at almost any stage of maturity. To many, this is a real advantage. They do not fight as roasters do and are not generally considered so hardy.

Those who are considering capon production should keep in mind that such birds must be handled carefully to avoid the introduction of disease. Caponizing tends to lower the resistance of the birds, at least temporarily, and they often contract colds, coccidiosis, etc. Under such conditions they are unlikely to prove a profitable investment. Care following the operation, and good sanitary surroundings during the growing period, with plenty of cool shade available, are essential to good capon growing.

In most every section there is a man who specializes in caponizing, and it must be noted that practice is necessary to obtain a high degree of efficiency. The beginners' usual difficulties are a high degree of mortality due to the operation, and "slips" (birds in which a portion of the testicle was left), the birds thus retaining their cockerel aspects.

For those who wish to caponize, it is recommended that birds be operated on when they are from six to nine weeks of age, or when they weigh from $1\frac{1}{2}$ to $2\frac{1}{2}$ pounds each. For the beginner, the larger sizes within the range are recommended as the testicles will be larger and more readily seen. It is important, however, that the above age and size range be adhered to if best results are to be obtained. The incision is smaller, the healing more rapid and the shock to the birds less when the operation is performed early in life.

In some sections, caponized cockerels are sold at two or three weeks of age, and where such stock is available poultrymen are purchasing them for capon growing. Caponizing of chicks at this age should not be attempted by anyone who is not familiar with this type of operation. As specialized meat production develops, undoubtedly more hatcherymen will have this type of started chick to offer for sale.

Before the operation, feed and water should be withheld for from 12 to 18 hours in order to allow the intestines to empty and to settle away from the testicles and upper wall of the body. If properly starved, cockerels are in less danger of having the intestine punctured when the incision is made. Also, a much better view of the testicle is obtained. Starving the birds for a longer period is unnecessary and may retard growth.

While the incision in the skin will scab over within a few hours, several days are required for recovery from the operation, and in many cases, wind puffs or air puffs will develop. These may be opened with the point

of a knife if they seem to distress the bird, but most of them will disappear if left alone. Some poultrymen follow the practice of putting a one-inch piece of yarn in the incision. This helps materially in lowering the incidence of wind puffs.

Following the operation, the birds should be transferred to a clean house with plenty of clean litter and confined for a week to ten days. It is better not to have roosts in the house, and feed hoppers and water receptacles should be accessible without the birds doing much flying or jumping. The same growing ration fed before the operation can be continued, and the birds should be provided with plenty of clean water as soon as they are placed in the house. Following this short period of confinement, the birds may be transferred to range or growing quarters.

It is important to keep in mind that only the best cockerels should be caponized. The poorer individuals should be sold as broilers.

"Slips" or birds on which the operation was not successful, should be removed from the capons as they develop. They may be told by their cockerel appearance, for they develop a comb and wattles, become active and generally take on the characteristics of a normal cockerel.

Capons are fed in the same manner as roasting chickens. This subject is covered on pages 132 and 133.

Fowl

Fowl are not grown primarily for meat, but are the by-product of the egg producer. They are full grown when ready for market and need only to be finished. Because the market increasingly demands a better



Fowl housed in summer shelters are usually in prime condition at selling time.

type of fowl carcass, it is recommended that the poultryman consider the meat qualities of the stock from which he is to purchase chicks.

The vitality of the parent stock is highly important if the poultryman is to have prime-quality fowl to sell at the end of the laying year.

Generally speaking, fowl should be sold just before the molt, in order that they may present a better-dressed appearance. Poultrymen will realize far more from their birds if they will closely observe the flock and sell them in advance of the molt, rather than try to get the last few eggs from them. The extra premium thus received and the extra body weight retained will more than offset the few eggs that may be lost.

Fowl that are on the verge of a molt should not be kept for finishing, but should be sold immediately, as birds that are molting present a very poor market appearance, both alive and dressed, and lose weight very rapidly.

Selecting Birds for Market

Only prime, fully developed, healthy, well-feathered birds should be selected for market. The poorer individuals should be culled and sold separately; otherwise, the price for all birds will be lowered and a much lower net price secured for the lot. Poor birds should be disposed of as early in life as possible. The best birds are the only ones that will make sound, economical growth and respond to finishing methods.

The best poultrymen generally practice a regular system of culling, setting aside a certain period each week when the poorer individuals are removed and sold, so that only prime birds which are able to show a profit are kept in the flock. Such a procedure not only insures a greater financial return but lowers the possibility of disease outbreak.

Finishing Birds for Market

Finish feeding adds weight, improves the quality of the meat, the color of the skin, and plumps out the bird thus placing it in a higher market grade. All prime, healthy birds usually respond to finish feeding. As a rule, birds running on large ranges should be confined to a smaller area, but if the smaller area lacks shade or is unsanitary, the birds will do better if left in their regular range quarters.

When the weather will permit, birds finish better out-of-doors rather than inside. If birds are brought inside because the weather is extremely cold, care must be taken to guard against colds, although plenty of ventilation should always be provided.

Birds should not be crowded during the finishing period and plenty of clean water, which is kept as cool as possible in the summertime, should be provided.

Birds that are to be finished should be graded. Older birds should be separated from younger ones, and prime stock separated from that which

is not in such good condition. Birds that are in good condition require less feed and less time to finish. Birds that are diseased, have been previously poorly fed, or are of inferior type, will not respond profitably to finish feeding and should be disposed of for what they will bring.

Feeding During the Finishing Period

Wirthmore provides two types of feed for finishing birds for market: Wirthmore Finishing Pellets and Wirthmore Fleshing and Fattening Mash. The use of pellets in the place of mash has not only given equal but often superior market qualities. Pellets, furthermore, greatly reduce the labor involved, require less skill on the part of the feeder, and usually result in lower feed costs. They are most strongly recommended, therefore, when superior market finish is desired.

Feeding Wirthmore Finishing Pellets: These pellets are usually fed in addition to the regular ration where broilers, roasters, capons, or fowl are to be finished. The palatability of Wirthmore Finishing Pellets invariably results in adequate amounts being eaten if they are plentifully supplied. When the appetite of the birds lags, it is preferable to restrict the amount of their regular ration and to encourage a larger consumption of pellets. In this case, the regular ration is only fed in amounts that will be cleaned up before mid-afternoon. Not later than an hour thereafter, sufficient pellets to last until dark are put into the hoppers.

When no signs of lagging appetite are evident, restriction of the regular rations is unnecessary. The pellets then may be fed either in separate hoppers or on top of the mash in such amounts as will be eaten from mid-afternoon until night. It is not only more economical but also contributory to better finish if Wirthmore Finishing Pellets make up as much as half of the total ration of the birds throughout the finishing period. This rate of consumption is desirable for a period of three weeks before the birds are marketed.

An alternative method of feeding Wirthmore Finishing Pellets is to give the birds, three times daily, all they will eat in 15 minutes' time, their regular rations then being fed in the usual manner.

Feeding Wirthmore Fleshing and Fattening Mash: This finishing mash may be used in either of two ways:

1. It may be fed as a dry mash in place of the regular mash for three weeks before marketing. The hoppers should be refilled daily. In addition to keeping Wirthmore Fleshing and Fattening Mash in the hoppers, one daily feeding can be given as a wet mash. Enough mash should be moistened with water or milk to form a crumbly mash. Feed this on top of the mash in the hoppers in an amount that will be eaten in about 15 minutes. This method may be employed for periods up to three weeks before marketing.



One of New England's live-poultry auctions.

2. For short finishing periods of about ten days, Wirthmore Fleshing and Fattening Mash prepared as a wet mash may be used as the only feed. Three to five feedings a day are given, pouring the moist mash into open-trough hoppers. Milk or water may be used in preparing this feed. In either case, sufficient liquid should be used so that the mixture pours readily and yet does not separate. Being a more intensive method of feeding, it should not be used for longer than ten days before the birds are marketed.

In either of the two systems of using Wirthmore Fleshing and Fattening Mash there is danger in extending the feeding periods beyond the recommended time, due to the possibility of the birds going off feed. If the flock shows signs of going off feed, pass up one feeding. Repeat this later if appetite again lags.

Selling Live Poultry

Where poultry is sold alive, it should, if possible, be sold at the farm. In this manner weights can be verified, and shrinkage is a problem of the buyer. There are poultry buyers throughout New England who will call at the farm and purchase the birds. Modern transportation and

handling methods have made it possible for buyers to buy very close to the market and still make a profit. Birds should be graded and culled before they are offered for sale as the poultryman will usually benefit by such a practice.

Many live-poultry auctions are springing up throughout New England, and these provide an excellent way of selling birds so that a good price may be obtained for the product. The auctions usually have one or two sales days through the week when poultry is put up for bid, and buyers are on hand to purchase it. A good product will always bring a premium price on the auction. When birds are sold at auction, it is necessary for the poultryman to truck his birds to the auction.

Selling Dressed Poultry

Most dressed poultry is either dressed and sold locally at special markets, or packed in barrels, iced and shipped to the large consuming centers. Some dressed poultry is being sold through the mail direct to consumers in the large cities. The use of dry ice, which keeps the birds in fine condition, makes this practical, even though the poultryman may be a considerable distance from a large retail center. It enables him to get good prices for his product.

It is highly important that good methods of killing and dressing be employed so that the carcass will be clean and present a good appearance. The package in which the birds are sold should also be attractive.

Where birds are sold directly to the consumer and are thus usually full-drawn, the interior of the carcass should be carefully cleaned out and all particles of internal organs removed, the legs cut and the tendons pulled. The neck should be removed and sufficient skin left to allow for folding so that the finished bird will present a good, full breast, completely covered. The neck, gizzard, heart and liver should be separately wrapped and placed within the bird. The bird should be singed where any evidence of hair remains on the carcass. An alcohol flame is desirable as it will not leave a smudge on the bird.

Many poultrymen are now wrapping the finished carcass of the bird in cellophane or similar wrapping material and using ribbon or other means of marking the package. Birds wrapped in this manner present a nice appearance and encourage greater consumption. They also bring a greater return than would otherwise be the case. With increasing competition from other types of meat and products which may be substituted for poultry, it is highly important that more poultrymen market their product in an attractive manner.

When shipped to wholesalers or to large receiving centers, birds should be packed in clean barrels, and a clean piece of burlap used to close the barrel after they are packed. Birds shipped in this manner are not drawn, and legs and heads are left on. The legs should be carefully scrubbed and the heads wrapped with a clean, attractive wrapper.

The birds should be well iced and are usually packed with a layer of cracked ice at the bottom, a layer of birds then placed in a circular manner in the barrel and then another layer of ice. At the top of the barrel a large, single piece of ice is usually placed, before the top is covered with clean burlap or cotton. Care should be taken not to drive nails through the barrel into the birds. Birds sold in this manner should be carefully graded, and only birds of one grade placed in a barrel.

Killing and Dressing Birds for Market

Most sections of New England now have men who make it their business to specialize in killing and dressing birds for poultrymen. Some of them go so far as to call at the farm and pick up the birds, take them to a central point, kill, dress and pack them, then ship them to market with the producer's own tag. The charge for this service is usually reasonable. Where poultrymen plan to do their own killing and dressing, they should first consider a properly laid out and equipped killing room. This saves much time and effort and turns a less desirable chore into a pleasant business operation. Killing and dressing is one of the most profitable operations on many poultry farms and deserves attractive, sanitary surroundings, as well as proper equipment.

Killing

Birds should be starved for 24 hours before killing to rid the crop of all material.

The most common, and still the most efficient way of killing is the poultry sticking knife. With the bird suspended by a cord and block, or by a suspension hook, the operator holds the head with the left hand, puts the knife in the mouth and cuts the back of the mouth with a sideways slit, just back of the groove in the roof of the mouth. This bleeds the bird well. The knife is then turned and pushed up through the groove of the mouth toward the top and back of the head to a point above the ear. If the "stick" is done correctly, it causes the bird to squawk and quiver as the knife enters the brain. A cut in the rear part of the brain destroys the nerve centers that control the muscle around each feather, and the feathers are then released easily. A weighted can is hooked into

the lower beak to catch the blood, to keep the bird extended for easy removal of feathers, and to prevent thrashing.



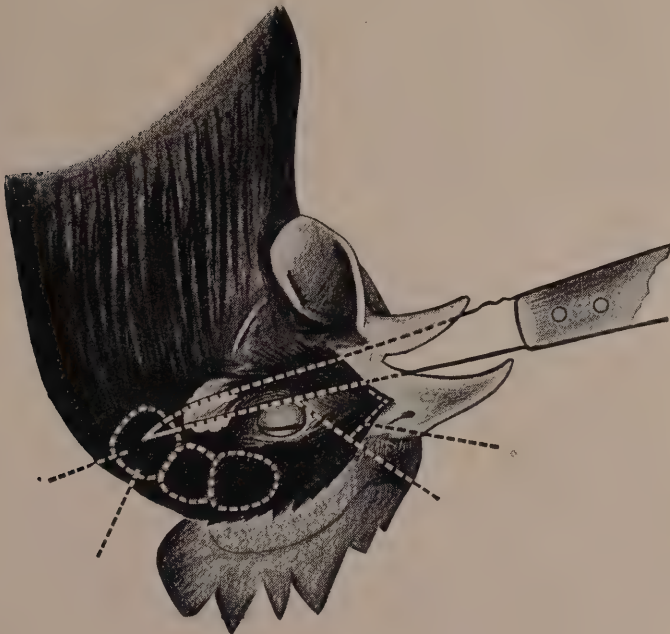
Lower jaw removed to show location of cuts—first in the rear left to sever the jugular vein, second through the rear of the groove in the roof of the mouth to stick the brain.

Electric killers now on the market give a fair release of feathers if the electrodes are correctly placed. A man accustomed to using a knife can usually get a better “stick”. Killing pliers are satisfactory, especially for those not killing frequently enough to become adept with a knife.

One of the most common mistakes in killing is improper bleeding which causes the bird to present a dark appearance and to deteriorate quickly.

Dressing

In general, there are four methods of dressing or feather removal. They are dry-picking, scalding, semi-scalding and wax-picking.



Showing the location and position of the knife to get the stick that releases the feathers.



Killing pliers in use.

Dry-Picking

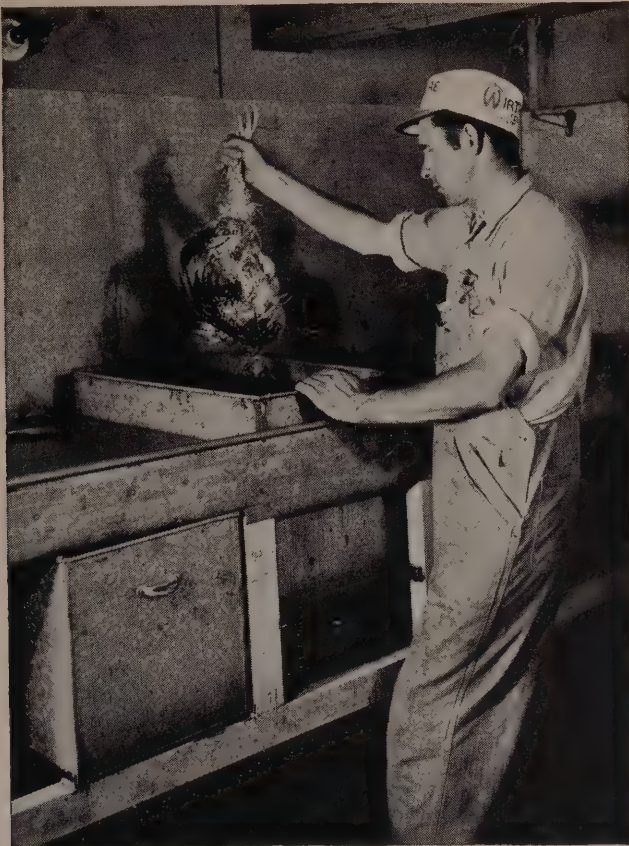
For the poultryman who has learned to "stick" the bird properly, or to debrain it, dry-picking is an easy method of feather removal which requires no extra equipment or heating of water. Following the "stick", which, if properly done, releases the feather muscles, the bird is picked quickly before the muscles have an opportunity to set. Generally, the larger feathers are removed first, taking all the main tail feathers in one grasp, and then the large feathers on each wing, followed by those on the breast and body. One should be careful to pull with the feathers, particularly on very young birds in order that their skin may not be torn. The essentials of this type of dressing are a good "stick" and quick removal of the feathers following the "stick".

Scalding

Scalding, probably the least desirable method of all, is still used by some poultrymen. By this method, water is brought to the boiling point and the bird immersed for as short a period as possible to loosen the feathers. Although the feathers are very easily removed by this method, the skin is often discolored, and the carcass presents a very poor appearance after a day or so. Birds that have been scalded should be immersed in ice water immediately after picking. This method of feather removal should not be used unless birds are to be consumed at once.

Semi-scalding

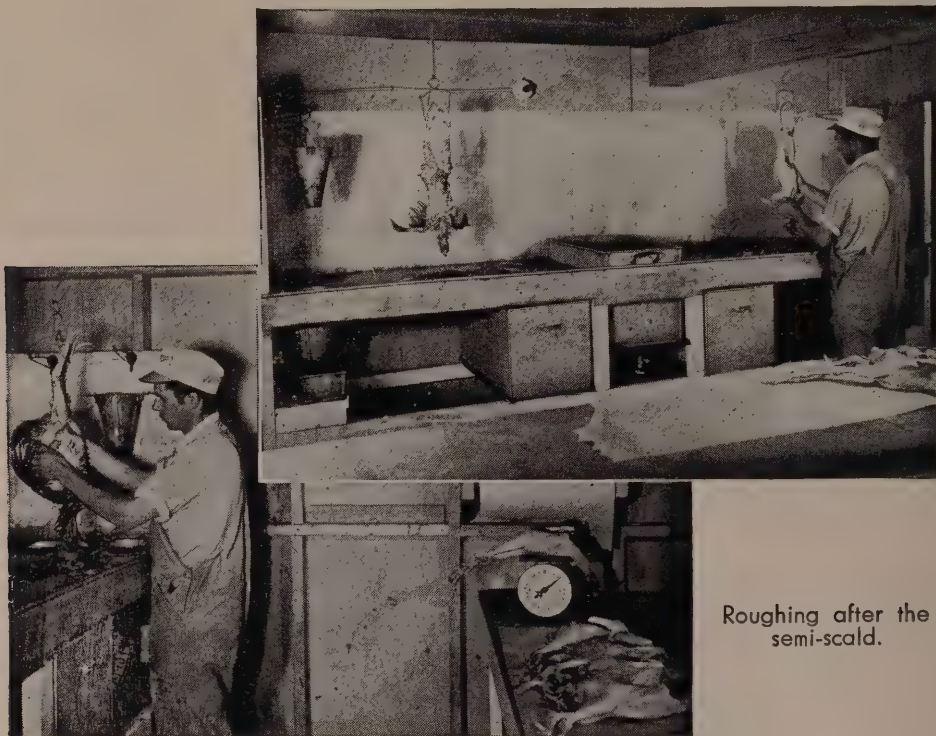
This method of picking is a tremendous improvement over the scalding method. Temperature of the water and time of immersion are carefully watched, and if the balance between them is noted and care taken, a bird can be dressed by this method with a minimum of effort and still present a fine-appearing carcass.



A semi-scald tank.

After the bird is killed and thoroughly bled, the carcass is immersed in water heated to quite an exact temperature. Fowl, roasters and capons should be immersed for 50 to 60 seconds in water ranging from 128 to 130° F. For young chickens, the water should be 125 to 127°, and they should remain in the water from 36 to 38 seconds.

While the carcass is in the water, it should be kept in an up-and-down motion to soak under all of the feathers. The exact time and tempera-



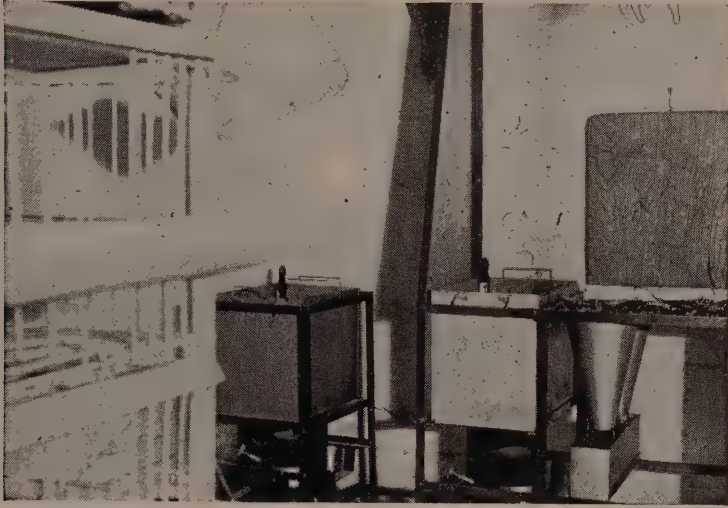
Roughing after the semi-scald.

ture between the given limits will be found by noticing the first few birds. The feathers should just reach the stage where they pull easily. A small tank with thermostatic control is of great assistance where any quantity of killing is done.

Wax-Picking

This is a new patented process for picking poultry which involves the use of a new patented wax. The process, like that of the semi-scald method, starts by dipping the birds into water for a given period of time and at a given water temperature — depending upon the kind and size of birds — and then rough-picking.

After roughing, the bird must be thoroughly dried. This is usually accomplished by hanging the bird for a period of time, sometimes using fans to hasten the drying. Another method used in drying the bird is placing it in a box of sawdust and rubbing sawdust against the skin.



Farm outfit for wax-picking.

After the bird is thoroughly dry, it is held by the feet and head, and the body dipped into the heated wax so that it is completely covered. It may be redipped in order to get a sufficient coating of wax. The wax used is a special patented one which has been developed especially for this purpose. The temperature of the wax is from 125 to 130°, and care should be exercised not to have it too hot as the bird will then become discolored after dressing.

After a good coating of wax, the birds are hung until the coating has had time to harden, although it should not become too hard and brittle. Recently a newer type of wax has been put on the market which seems to be lighter and more flexible and seems to have the advantage of easier removal. Ordinarily, the bird is dipped into cold water for a minute or two after the wax has partially hardened, and the wax is then peeled off.

The wax may be reclaimed by heating and straining.

If enough birds are picked at a time to warrant the effort of preparing to wax-pick, and clean up afterward, this method becomes practical.

Most commercial dressing plants today have installed machines which are operated with a continuous belt arrangement on which birds are hung, killed and bled, roughed, automatically dipped in wax, dried and peeled, all in a continuous operation which is carried on by different

persons stationed along the moving belt. There are several commercial installations available for the large operator, as well as simple and less costly installations, which have the advantage of automatic temperature control, for the smaller operator.

Selling Canned Poultry Meat

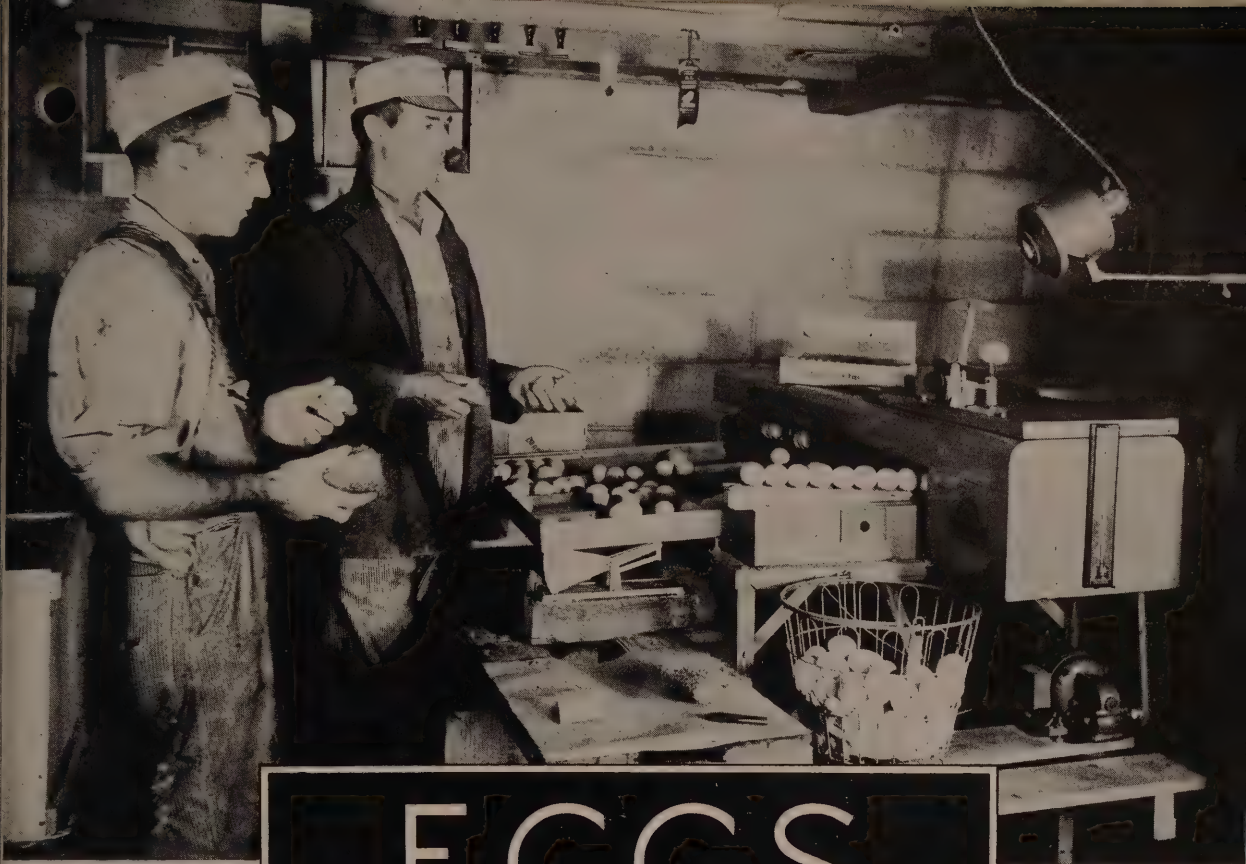
Many poultrymen find that selling canned poultry offers a means of getting a satisfactory profit on birds that would otherwise bring a rather low price on the general market. Canned poultry also offers an opportunity for reclaiming much poultry meat which would otherwise be lost because of the small quantity available at a time; or because the carcass was somewhat mutilated, as in the case of cannibalistic outbreaks.

Birds can be canned in regular preserving jars by the usual methods of canning meat; or a canning device can be secured at a low cost for putting them in regular tin cans, to which the producer's own label may be attached. A considerable market has been built up by some poultrymen for this canned product at a price which insures a good profit. In canning poultry the carcass is usually cut as in fricasseeing and canned with some of the bones.

Selling Special Poultry Meat Products

Where local markets are available, many poultrymen find a market for birds which would otherwise have to be sold at a sacrifice, through selling chicken meat-loaf, chicken pies, chicken rolls or other especially cooked poultry products. For retail sale, the number of ways of preparing poultry is only limited by the imagination of the poultryman. A poultryman building a retail business can well afford to educate customers to the different types of poultry he has available and the many different ways of using them.

It will be well for the poultry industry and for the consuming public when all concerned understand and recognize that the better-meated, well-finished bird furnishes more meals per dollar. It pays to buy, and it pays to sell higher-grade poultry.



EGGS

THE egg is the basic product of the poultry industry. The demand for quality of this basic product follows down throughout its channels of disposal. From the market egg to the highest priced hatching egg, there is, and always will be, a premium paid for quality. It may not be a premium which, at the moment of the sale transaction, is of tangible form, but it is none the less present. The ultimate receiver of the product, in whatever form it reaches him, will eventually recognize quality and pay for it. At the same time, he will tend to buy and use more of the quality product, thereby improving market conditions.

The standards of quality for eggs are well established and recognized throughout the industry. There is no single agency within the industry



MORE QUALITY - GREATER DEMAND



Creditable displays like this one help SELL fresh eggs.

but which must carry its part of the load. From the breeder who propagates strains of egg producers, through to the ultimate consumer, there is no point where these standards may be lowered without doing harm to the final product and the consumer demand.

A constant endeavor on the part of the industry to meet the standards of quality as established, coupled with consumer knowledge and demand for these standards when purchasing eggs, creates a healthy situation. The bond of quality is the strongest tie between the producing industry and the consumer.

EGG QUALITY

Publicizing of Eggs

As the poultry industry in New England tends to grow and expand, it is faced by a distinct challenge. It is one of awakening the consuming public to the fact that the basic product of the industry, the market egg, is one to be desired in greater and greater amounts. As an industry expands and grows, the commodity which it produces will increase in amounts produced. This in turn presents increasing marketing problems.

Any modern industry will seek to stimulate increased sales for their product by reaching their consuming public through different types of advertising. Literature, radio and all other available agencies are used to inform this public that the product being produced is to be desired in increasing amounts. Such action is necessary from the poultry industry, and little has been done along these lines.

The threat of over-production of eggs does not come from outside of our area alone, but from the increased activity within New England itself. We have something to sell in the form of fresh eggs, which are quality eggs if produced and handled as such, and these the public should desire in increasing quantities.

More should be done about selling eggs in competition with other highly publicized food products. Any worthy effort in this direction should receive the whole-hearted support of New England poultrymen and all others connected directly or indirectly with the poultry industry here in New England.

The Consumer's Standard

Uniformity in the package as opened is the first impression of quality. The dozen of eggs should be uniform in size, shape and color. They should have uniformly smooth, firm shells. When the eggs are opened, the interiors should indicate freshness, with a delicate aroma. The yolks of the eggs should stand up perfectly, held in shape by the firm, thick white, surrounded by a minimum of thin white. The color of the yolks should be a uniformly clear yellow. The taste, before and after cooking, should be delicate and pleasing.

This type of egg can, and should be, at the disposal of the consumer. It requires attention to detail in all of the operations vital in the handling, selecting and packaging. Proper equipment and knowledge of its use are necessary in obtaining satisfactory results. Above all, a knowledge of the egg itself is necessary to handle it properly.

The Formation of the Egg

The product which the domestic fowl manufactures is extremely complicated. She obliges us by taking in raw materials and processing them into a complete food, high in nutritional value, enclosed in a fine package. Her manufacturing processes are precise and, in many ways, incredibly accurate. In the process, a balanced ration may be assimilated, the necessary nutrients picked up by the blood stream and carried to the reproductive organs. Here, each portion of this system picks up the material necessary to apply at its part of the assembly line.

At the head of the assembly line is the ovary. It is the source of the ovum which, when fully developed, is the yolk of the egg. Each female is equipped with this organ which has as many as 3,000 of these undeveloped yolks. As the bird matures, these ova begin to develop and grow in systematic order. In this process of growth, the blood stream



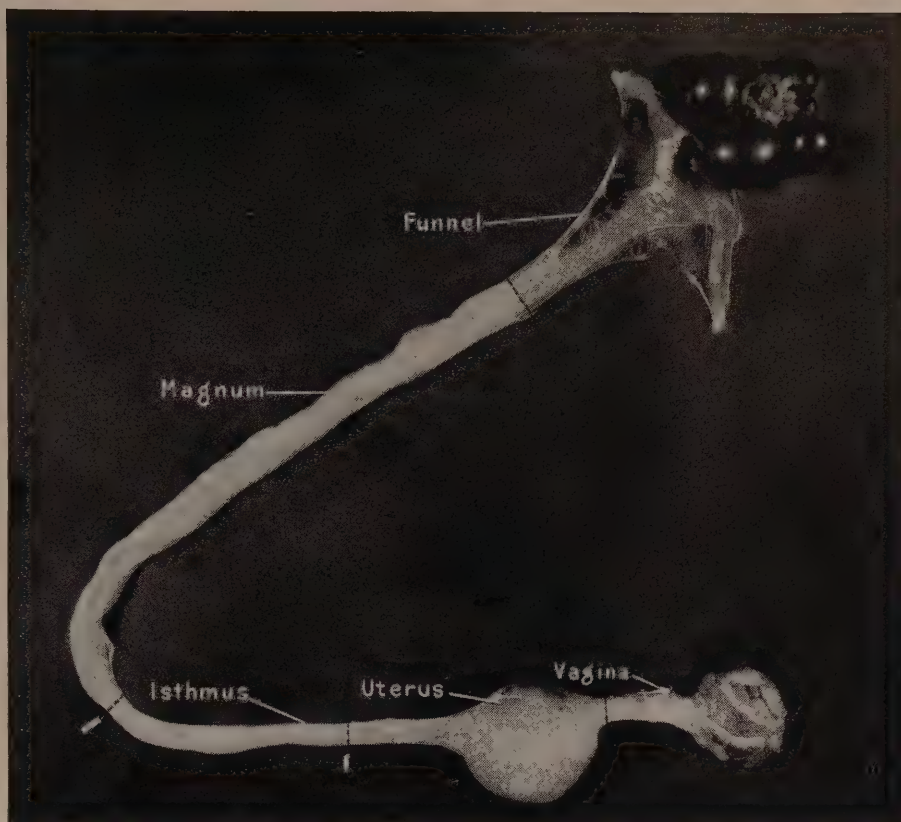
Breast and digestive tract of the hen laid aside to expose the reproductive organs. Showing yolk cluster on ovary, infundibulum, and oviduct.

carries to the individual ovum the nutrients which are necessary to build the vital parts of the baby chicken during the period of incubation. It is a process of manufacturing one of the most complete foods that nature devises. Highly nutritional proteins, fats and minerals are its make-up, presenting a high vitamin content.

Each ovum finally ripens over a period of about 14 days and, in its turn, is released to be picked up by the funnel-like end of the oviduct, known as the infundibulum. This process of release is known as ovulation. From this point, the ovum travels into the portion of the oviduct known as the magnum where the albumen is secreted. Here it spends about three hours. There are three distinct layers of albumen applied by the glands, and here the chalazae is manufactured. This again has been a process of applying part of the food necessary for the development of the baby chick during incubation and which is equally fine for human consumption.

From this point, the partially formed egg proceeds to the part of the oviduct known as the isthmus, and here the shell membrane is applied. When the shell membrane is completed, the remainder of the albumen is

applied by an osmotic process. Part of this operation occurs in the isthmus and the remainder, in the uterus. This completes the interior of the egg.



Egg-producing organs of a hen.

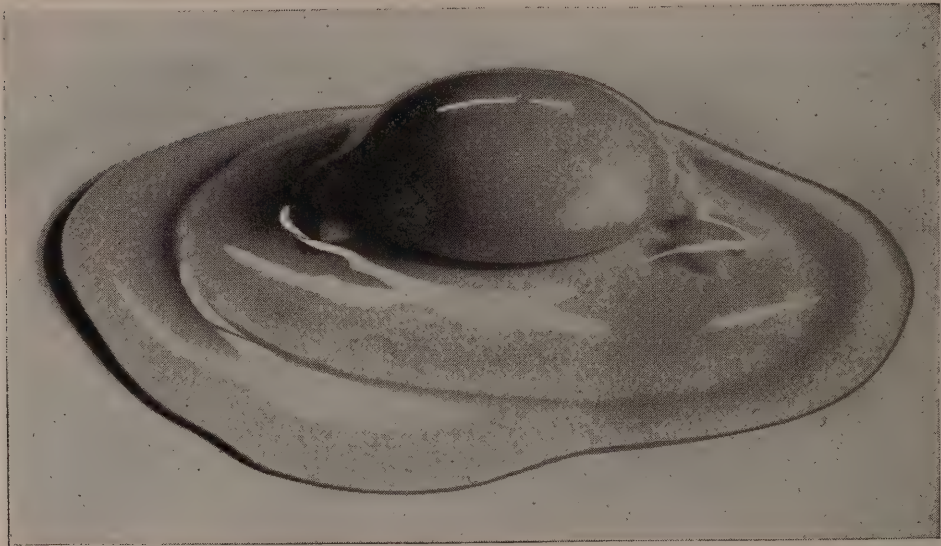
COURTESY UNIVERSITY OF ILLINOIS, COLLEGE OF AGRICULTURE, CIRCULAR 494.

After this, there is a period in the uterus of about $1\frac{1}{2}$ hours when the shell and its pigmentation are applied. The completed egg has been built around the yolk, the process in the average hen consuming about 26 hours. The length of this period depends upon the individual bird and her inherited rate of lay.

The Normal Egg

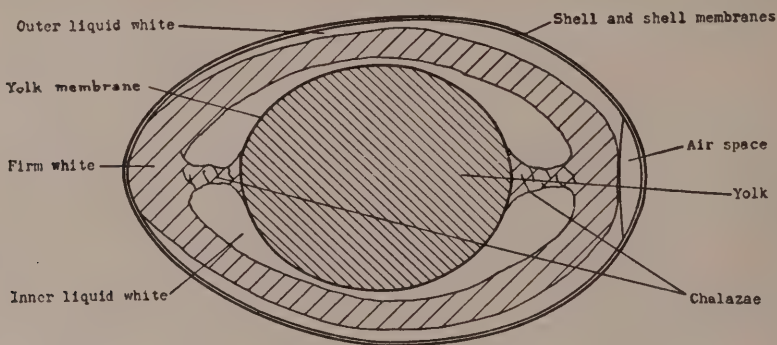
The normal egg is a complex product designed by nature for reproduction purposes. From the standpoint of the poultryman, he should see in a fresh egg, under the candle, an air space about $\frac{1}{8}$ " deep, about the size of a dime. The contents should show stability, the yolk being prac-

tically invisible, with very little movement. The white should be clear and firm. From outward appearance, the shell should be solid and free



from roughness and porous appearance. When broken out, the consistency of the white and height and breadth of the yolk should be similar to that in the illustration if it is to grade high.

The yolk color may vary, but is preferably a uniform yellow. The membrane surrounding the yolk should not rupture easily. The germinal disk will appear on the upper surface as a small, light-colored spot. The



Interior arrangement of the hen's egg.

COURTESY H. J. ALMQUIST, UNIVERSITY OF CALIFORNIA

chalazae has the appearance of knots of loose cotton twisted with thread, radiating from two sides of the yolk. There should be a freedom from foreign materials such as blood spots, meat spots, etc.

From the standpoint of the chemical composition, there exist the food and vitamin values contained in the following tables:

Chemical Composition of the Hen Egg*

	Refuse (mainly shell)	Water	Protein	Fat	Ash	†Total
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Whole egg	11.2	65.5	11.9	9.3	0.9	98.8
Whole egg (edible portion)		73.7	13.4	10.5	1.0	98.6
Egg white		86.2	12.3	.2	.6	99.3
Egg yolk		49.5	15.7	33.3	1.1	99.6

*Langworthy, C. F., "Eggs and Their Value as Food." U. S. Dept. Agr. Bulletin 471, 29 p., illus., 1927.

†The difference between these total percentages and 100 is made up of undetermined substances.

Vitamin Value	Whole Egg	White	Yolk
Vitamin A	Excellent		Excellent
Vitamin B	Good		Good
Vitamin C			
Vitamin D	Good		Excellent
Vitamin G (flavin)	Excellent	Good	Excellent

ABNORMALITIES OF FRESH LAID EGGS

Abnormal Eggs

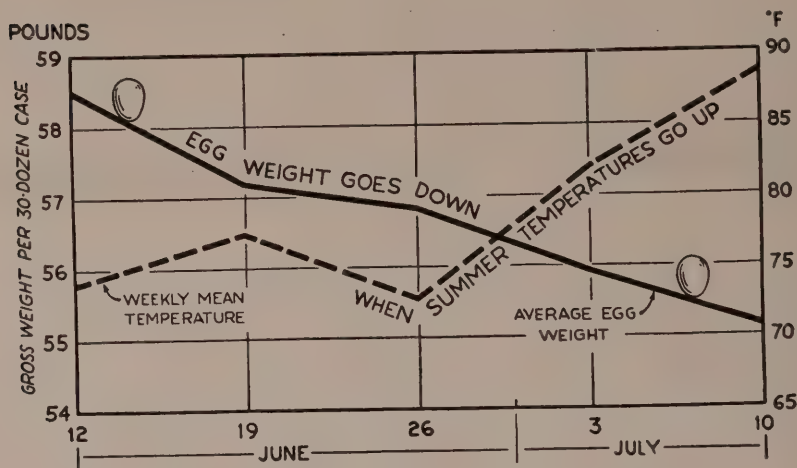
Causes

1. Double and multiple yolk eggs. Due to irregular ovulation where more than one yolk breaks away from ovary at one time.
2. Blood spots. Rupture of blood vessel at time of ovulation.
3. Bloody egg. Rupture of blood vessel along oviduct.
4. Meat spot. Sloughing off of tissue from wall of oviduct.
5. Mis-shapen eggs. Abnormal functioning of uterus.
6. Soft-shelled eggs. Improper functioning of shell-secreting glands in the uterus.
7. Yolkless eggs. Any foreign material entering uterus and causing stimulation of secreting glands.
8. Egg within an egg. Due to regurgitation of egg already formed. It passes back through oviduct, and another egg is formed around original.

Factors Governing Exterior Quality of Eggs

A. Size.

1. Breeding: — Egg size is an inherited characteristic.
2. Seasonal Influence: — High temperature will tend to cause smaller egg size.
3. Date of Hatch: — Out-of-season hatched birds with a tendency to mature at earlier ages lay smaller eggs and tend to reach their maximum egg size at a slower rate.
4. Lack of drinking water reduces egg size temporarily.
5. Improper rations will have some effect on egg size but less than other factors.



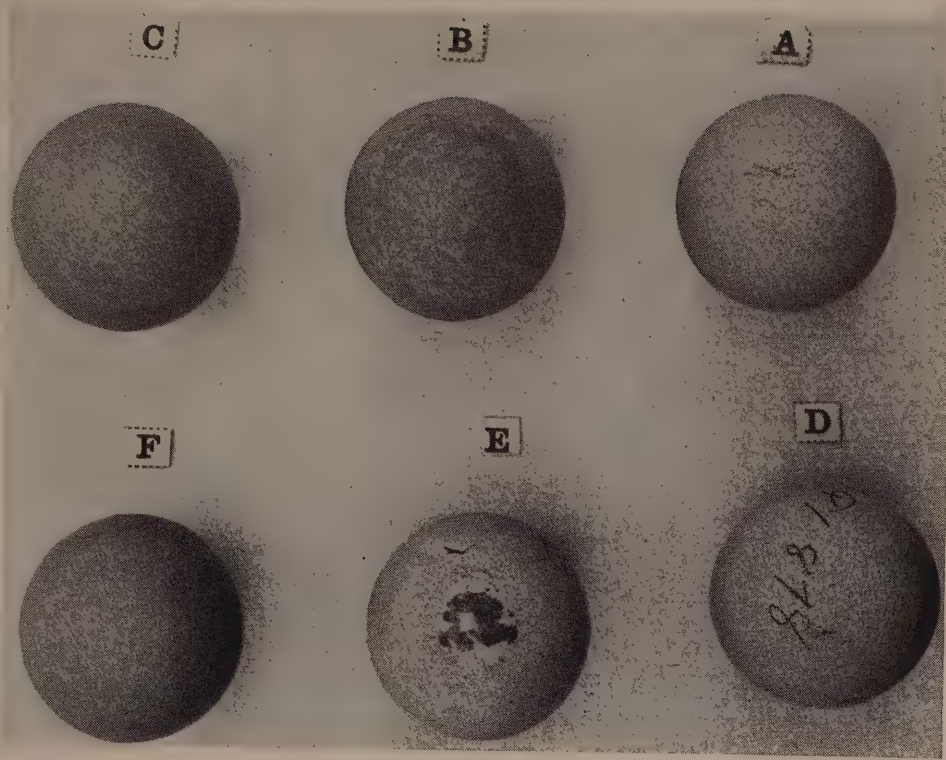
EGG WEIGHT FALLS OFF IN HOT WEATHER

In a test during five summer weeks, all the eggs marketed from 1200 layers (hens and pullets) were weighed and weekly averages computed. When the temperatures advanced from about 73°F. to 88° the eggs lost an average of 3½ pounds per case.

COURTESY UNIVERSITY OF ILLINOIS, CIRCULAR NO. 494

B. Shell. Ideal: — Strong, with smooth texture free from conspicuous ridging and irregularities.

1. Breeding: — Granular, sandy surfaces are inherited characteristics. Tendency to produce eggs with weak tips and butts is an individual trait and inherited. Tendency of shell texture to fail at end of laying season with individual birds is an inherited characteristic.
2. Feeding: — Deficiency of vitamin D in ration and poor mineral balance is apt to result in poor shell texture.
3. Disease: — Acute cases of respiratory troubles occasionally result in extreme abnormalities in shell texture.



CHARACTER OF TIPS AND BUTTS

	Tips		Butts
C.	normal	F.	normal
B.	thin	E.	thin
A.	sandy	D.	sandy

COURTESY MASS. EXPERIMENT STATION, BULLETIN NO. 344

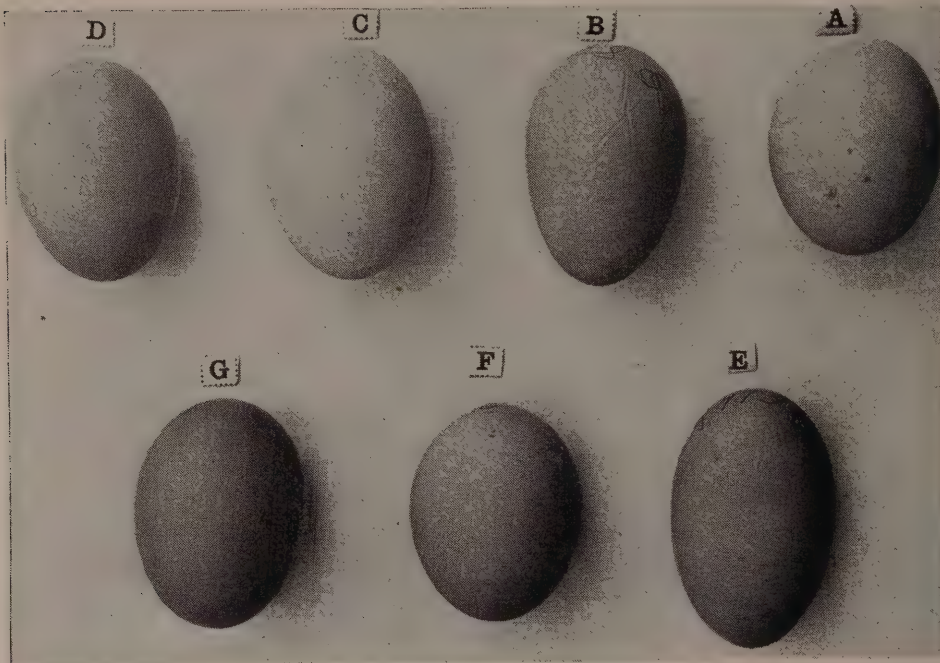
C. Shape. Ideal: — Uniformity, avoiding extremes.

1. Breeding: — It has been generally accepted that shape of the egg is an inherited factor. Some recent investigations would seem to discount this.



Examples of mis-shapen eggs and loss of shell texture due to an acute attack of a respiratory trouble in the laying flock.

2. Disease:— Acute cases of respiratory troubles occasionally result in extreme variations in egg shape.



SHELL TEXTURE AND EGG SHAPE

Texture		Shape	
D.	normal	G.	normal
C.	sandy	F.	round
B.	ridged	E.	long
A.	rough		

COURTESY MASS. EXPERIMENT STATION, BULLETIN NO. 344

- D. Shell Color. Ideal:— Uniformity in shell color — tinted well for brown eggs, free from tinting for white eggs.

1. Breeding:— Shell color is determined by inherited characteristics.

- E. Shell Cleanliness. Ideal:— Shell exterior to be kept free from foreign matter, particularly fecal matter.

1. Management:— Lack of adequate nesting facilities, wet litter and availability to dropping boards most common causes for soiled eggs.

Factors Governing Interior Quality of Eggs

- A. Air Cell. Ideal:— When candled, the air cell should be about $\frac{1}{8}$ " deep and about the size of a dime. It should be fixed at the butt-end of the shell.

1. Breeding:— Inherited porous shell texture will hasten evaporation of albumen and enlargement of cell. Inherited poor albumen will more readily

evaporate, and, at the same time, allow the air cell to become tremulous more quickly and easily.

2. **Handling:**—Tremulous air cells which are not fixed to butt-end of shell are often due to mishandling. This is more likely to happen where eggs are poorly packed.
3. **Holding Conditions:**— Holding under conditions where high temperatures and low humidity exist hastens evaporation of the contents and enlargement of air cell. Temperature and humidity are recognized to be much more important than the time element.

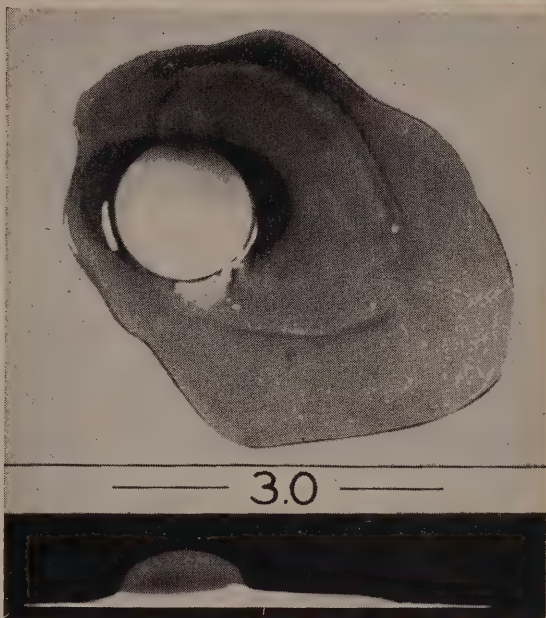
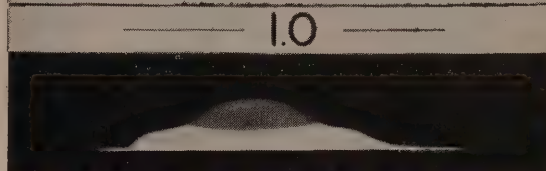
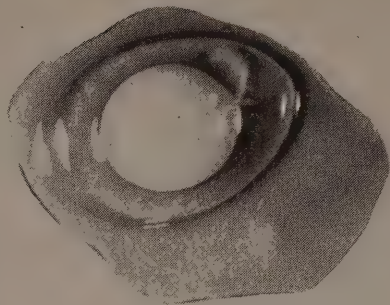
B. Consistency of Albumen. Ideal:— Firm, thick albumen supporting the yolk, surrounded by a minimum of thin, watery white.

1. **Breeding:**— Studies of eggs broken out within 12 hours of gathering from the nest, show wide variations in albumen quality. In such cases, inherited individual characteristics are responsible.
2. **Storage:**— Holding of fresh normal eggs, even for a few hours, under conditions of high temperature and low humidity causes a rapid break-down of quality in the egg white.
3. **Feeding:**— Wide ranges of diets have been fed in tests and have not affected quality or viscosity of white to any appreciable extent.
4. **Stage of Production:**— The whites, thick and thin, of a pullet's first egg are somewhat firmer than the whites of the eggs she lays later.

C. Yolk Color. Ideal:— Preferably a light yellow color. Above all, uniformity of color.

1. **Feeding:**— The effect of feeding on this characteristic is marked. A change from a ration producing uniform, light yellow yolks to a ration rich in pigment value may abruptly cause the change of the yolk color to a deep orange. Addition and increase of ingredients which are heavy pigment carriers, such as green feeds, dry alfalfa and corn meal will cause yolks to become deeper colored.

RIGHT: All three of these eggs were photographed within 12 hours of the time they were laid, so in this case no storage element is involved. A difference in the quality of the eggs **when laid** is the answer here.



D. Yolk Quality. Ideal:— One that stands up well and which has a strong vitelline membrane.

1. Physiological Condition:— Mottled yolks may develop inside the hen.
2. High holding temperatures cause mottled yolks. Long holding under adverse conditions tends to weaken the enclosing vitelline membrane.

E. Flavor. Ideal:— An aroma and taste both delicate and fresh.

1. Feeding:— Long periods of feeding of certain materials such as garlic and onions, which carry strong odors, will result in the flavor being transmitted to the egg.
2. Individual Characteristic of Hens:— Work that has been done along these lines fixes the blame for much of the fishy eggs and other egg odors on individual birds.
3. Handling:— Eggs quickly absorb odors of other foods, musty materials, etc.

F. Vitamin Content. Ideal:— High vitamin content.

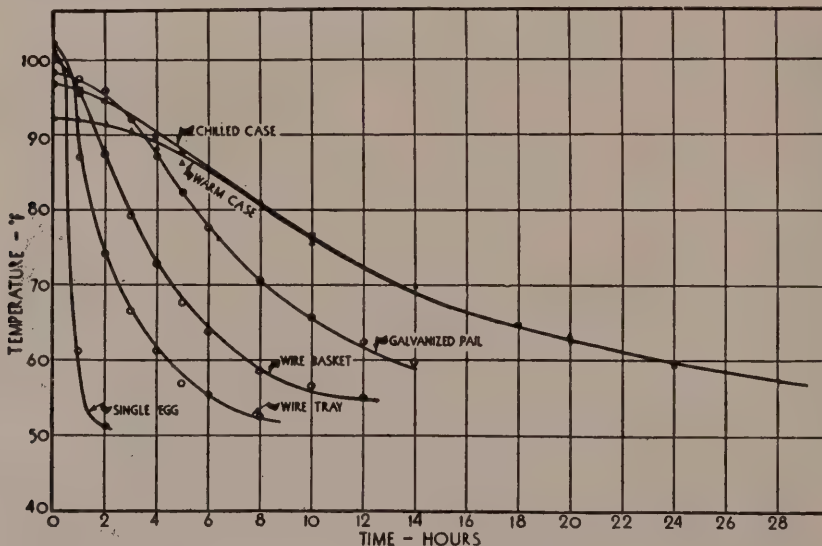
1. Feeding:— Several vitamins occur in eggs in variable quantities. This variability is influenced markedly by the vitamin content of the hens' ration. This is particularly true of vitamins A, D, E and the G complex.

G. Storage Abnormalities. The eggs should be free from blood rings, stuck yolks, mold spots, etc.

1. Storage Conditions:— Under proper conditions of storage, these abnormalities do not occur.

The "Do's" for the Sake of Egg Quality

Buy laying stock that will assure reasonable egg size, good shell texture which will be maintained throughout a laying season, and albumen quality which is present when the egg is laid.



Effect of container on the rate of cooling in eggs held in an egg room (50°F.)

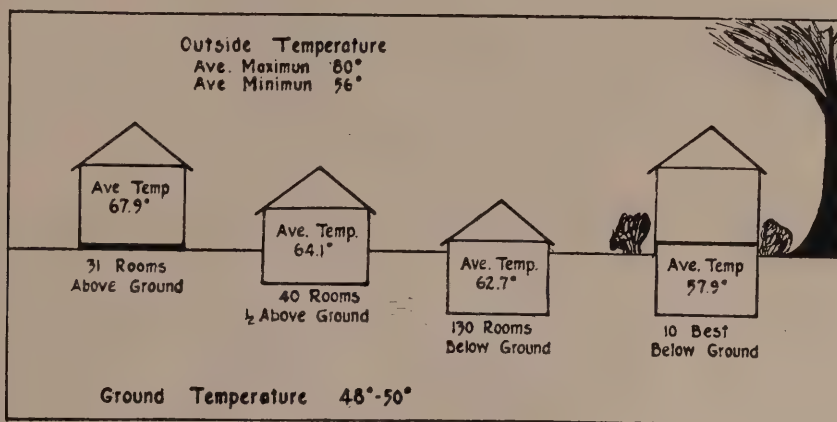
COURTESY MISSOURI AGRICULTURAL EXPERIMENT STATION, BULLETIN NO. 350

Use a well-balanced ration that will assure uniformly colored yolks, good shell texture and a high level of vitamin content within the egg.

Provide good environmental conditions for the layers; such as dry litter, wire covered dropping boards or pits, and ample, clean nests.

Collect eggs often, using open containers and transferring eggs quickly to a cool egg room, thus assuring quick cooling.

Mark egg containers with date-cards to assure disposal of eggs in order of production.



Summary of 210 Connecticut egg rooms.

COURTESY CONNECTICUT STATE COLLEGE EXTENSION SERVICE, HOME EGG-LAYING CONTEST, BULLETIN NO. 6

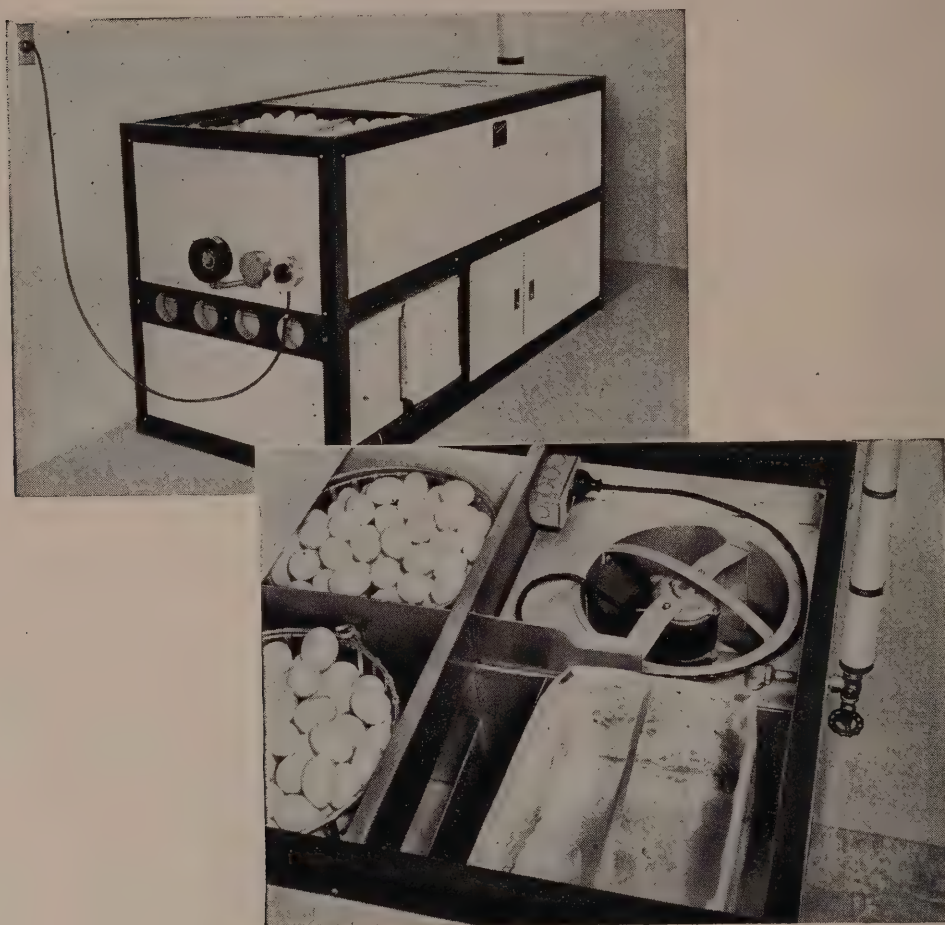


An efficient underground egg room.

Provide egg holding conditions:

1. in which the temperatures are 60° F. or lower. Rooms underground have proved most satisfactory. Coolers may be constructed or purchased for rooms on the ground level. Natural shade near entrance and over outside of building is helpful.
2. which produce high humidity. The relative humidity within the egg cellar should be maintained at from 77% to 90%, occasionally higher. Sprinkling

- floors, hanging wet bags or directing a fan on a water surface works out well.
3. which are well ventilated. Ventilation is necessary, as high humidity without ventilation would result in mold and musty conditions. In hot weather it is desirable to open windows only at night.



Views of an efficient commercial egg cooler.
COURTESY SHENANDOAH EQUIPMENT CORPORATION

Grade eggs for uniformity of size, shape and general appearance. (Use egg scales for doubtful eggs.) It is good practice to candle all eggs in order to remove those with blind checks, meat spots, blood spots, etc. Clean soiled eggs the day they are gathered. Experimental work by Dr. E. M. Funk of the University of Missouri dealing with the use of solutions of lye (sodium hydroxide) indicates that it may be used without impairing the eggs' keeping quality. The dilutions are as follows: one can of lye (12 oz.) to ten gallons of water, or two level teaspoonfuls to one quart of water. Use three quarts of this solution to wash 15 dozen eggs, or six quarts to a 30-dozen case. Rubber gloves should be worn when

using this lye solution. A variety of egg-cleaning equipment, including emery cloth, steel wool and a knife, will produce satisfactory results without washing when eggs are only slightly soiled.

Use a package for marketing:

1. which is representative of the quality of the product being sold.
2. which is uniform, neat and clean in appearance, whether it is a 30-dozen case or a dozen-carton. A few cents to insure attractiveness of the package will produce dividends.
3. which is well marked to represent the interior contents.
4. which is well cooled before packing for market.
5. which is properly packed in such a manner as to protect its contents. The eggs should be placed small ends down. Long eggs should be packed next to center partition. The extra large eggs should be placed on the top layer. When necessary, cover may be raised by nailing $\frac{1}{2}$ " strips to the end and center partitions.
6. which is protected in transit from temperature and other elements.

It is to the poultryman's advantage to do all he can to make sure that receivers of eggs, whether large buyers or housewives, are aware of the requirements for maintaining egg quality.



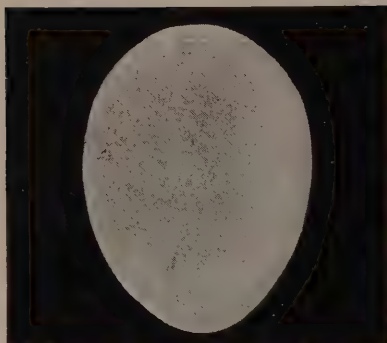
New England auctions have done much to increase the demand for quality eggs.

FRESH EGGS

NOT FRESH

These eggs were kept in a warm room (80°F.) for six days.

Candled Appearance
(Drawn from actual experiments)

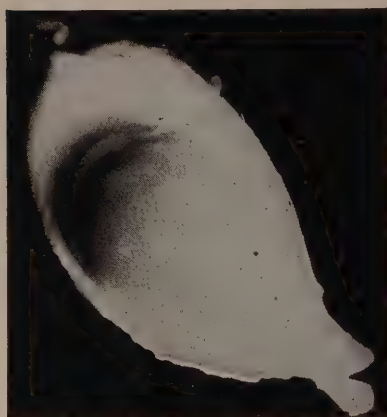


Small air cell. No yolk shadow visible. A perfect egg.



Yolk next to shell. Almost complete breakdown of supporting membranes. Heavy evaporation.

Poached Eggs
(Notice that only good eggs poach successfully)



A perfect poached egg. See how smooth and well-rounded the yolk is.

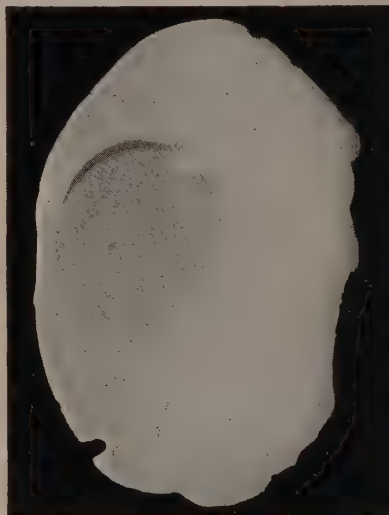


White is so weak that some of it has actually parted from the yolk!

Fried Eggs
(Showing spreading out of whites)

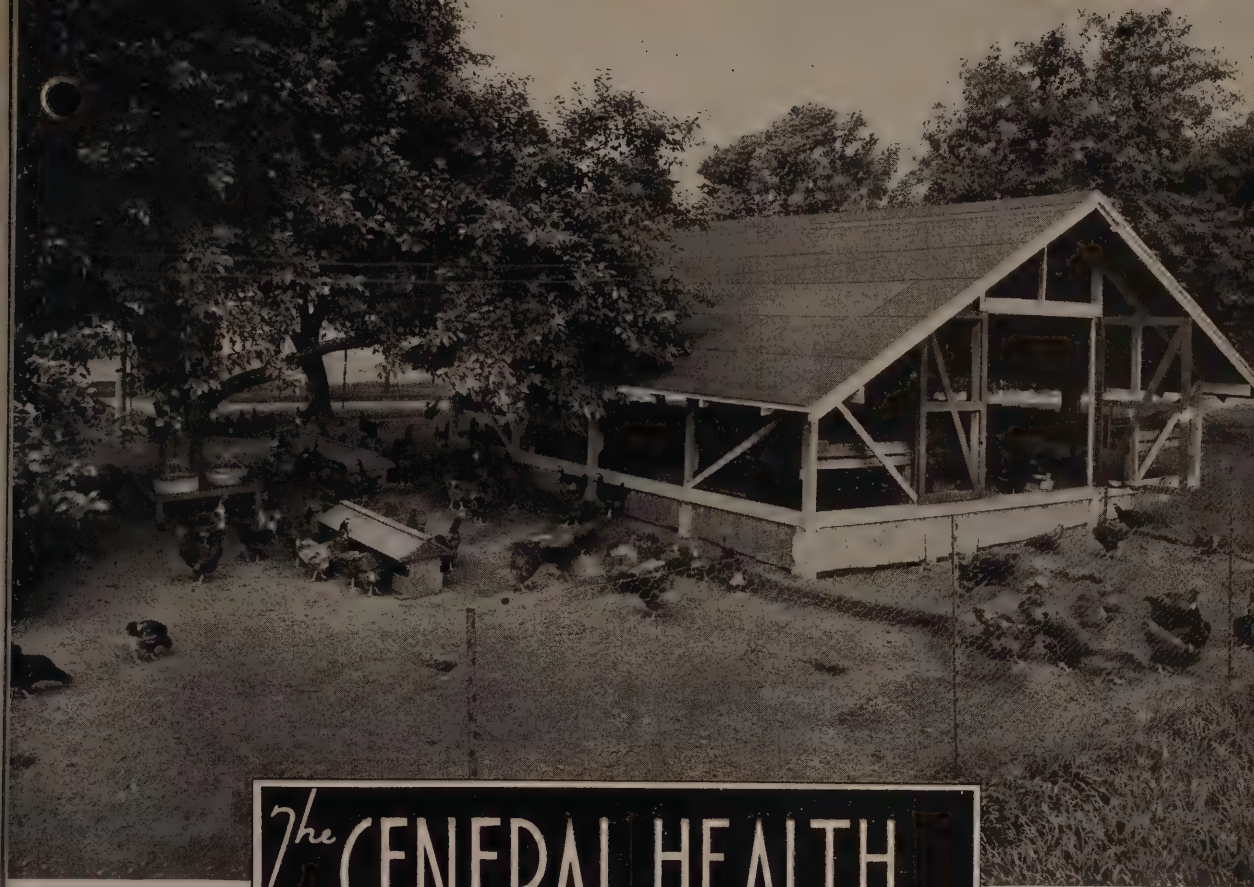


Yolk is close-knit, solid, and slightly raised



Weakened white has now spread over a wide area. Even the yolk is flat and watery.

COURTESY
SWIFT & CO.



The GENERAL HEALTH

A discussion of chicken diseases and their control, if given in its entirety, would require more space than is available in this seventh edition of "Timely Topics on Poultry Management". An attempt will be made, however, to present an up-to-date and practical resume of those diseases found in New England. It is hoped this information will be of use to those poultrymen who wish to safeguard the health of their flocks.

The study of poultry diseases is comparatively new, and scientific investigators are continuously uncovering new facts regarding these diseases. The poultry industry is, because of economic necessity, growing into commercial units which in turn present artificial conditions under which the bird has to live to produce marketable products at a profit. This transition from natural to artificial surroundings has been very



of the POULTRY FLOCK

rapid and probably the cost of such change is paid, in part, through losses from disease.

Mortality from disease is very discouraging. If these losses occur when the birds have reached the age of maturity, it is much more discouraging than if they occur when the birds are young. There is very little income from the growing flock. After successfully raising the pullets, to experience heavy mortality soon after they start production is, in many cases, enough to force some poultrymen out of business.

Poultrymen must be always on the watch for the development in their flocks of symptoms which are significant of a disease condition. They must be well versed in the natural habits of the birds in order to know when they do not appear normal. A good feeder will recognize the presence of trouble when he notes a decrease in feed consumption. The old adage that "an ounce of prevention is worth a pound of cure" is just as true now as it ever was. Practically all diseases may be controlled. Some require more drastic control measures than others, however. Only a very few treatments or measures are specific for particular diseases. It is necessary, then, to learn how to prevent diseases and in many cases to learn how to fortify the birds' resistance when the disease is present.

Poultry Management and Disease Control

To help accomplish a satisfactory control of poultry diseases, this book presents sound principles of poultry management. In the main, these principles include the following points:

1. Start with chicks that come from stock which has demonstrated ability to produce thrifty, healthy, vigorous birds that lay well. Such flocks should be free from pullorum disease and all other diseases so far as is known.
2. Brood the chicks in clean brooder houses and never crowd them. Never have over three chicks per square foot of floor space.
3. Keep litter dry at all times.
4. Range birds on clean, dry ground. It is better to practice a three-year rotation of the ranges and never range more than 300 birds per acre. Provide some shade, if possible.
5. Always provide good and adequate feed and water. Use a good commercial ration and feed it according to the manufacturer's directions.
6. Vaccinate the birds while they are on range to protect them from those diseases which may be prevented through vaccination. Always consult the poultry pathologist at your state agricultural experiment station, or some other competent authority, before vaccinating. Some of the vaccines on the market have little value. In some states a permit is required before vaccinating for laryngotracheitis.
7. House only well-grown, strong and healthy-looking pullets.
8. Keep laying pens dry and do not crowd the birds. It is best to allow four square feet of floor space for each bird of the heavier breeds.
9. If possible, let someone care for the old birds other than the one who cares for the younger stock or chicks. There may be disease carriers among the old birds that are capable of infecting the younger stock, even though they themselves show no symptoms of disease.
10. It is dangerous to introduce new stock, other than as eggs or day-old chicks. Older stock may be carriers of disease.
11. Do not return birds from shows, auctions, or egg laying contests to the flock. If it is ever necessary to do this, place such birds in isolation and under strict quarantine; that is, put them by themselves in a place where they will not be

near the rest of the flock, and have someone care for them who does not come in contact with the other birds. Place with this isolated group, three or four birds from the regular flock. If neither the quarantined nor the regular birds show any disease condition after a month, the poultryman may assume that it is safe to return these birds to the regular flock.

12. Keep visitors out of the feed room and pens.
13. Do not admit any old feed bags or dirty crates to the farm.
14. Be always on the watch for disease conditions. When the chicks or birds do not appear to be normal, do not hesitate, but instead get in touch immediately with the poultry pathology laboratory in your state, the State-Extension poultryman, the Wirthmore Poultry Service representative in your territory, or some other competent authority.

A list of the poultry pathology laboratories of the New England States is given below, together with information regarding fee required:

STATE	ADDRESS	FEE REQUIRED	
Maine	J. F. Witter, Animal Pathologist College of Agriculture University of Maine Orono, Maine	Resident NONE	Non-Resident NONE
New Hampshire	Poultry Pathology Laboratory University of New Hampshire Durham, New Hampshire	NONE	\$2.00
Vermont	Poultry Disease Laboratory State Dept. of Agriculture Montpelier, Vermont	NONE	NONE
Massachusetts	Dept. of Veterinary Science Massachusetts State College Amherst, Massachusetts	(See Note) NOT EXAMINED A specimen (shipment) is to consist of not more than five chicks or two adult birds from one farm. No fee when submitted at suggestion of County Agent or his representative, or when specimens are brought to the laboratory by the owner; all other specimens, \$2.00.	
Rhode Island	Dept. of Poultry Husbandry Poultry Autopsy Laboratory East Farm Rhode Island State College Kingston, Rhode Island	NONE	NOT EXAMINED
Connecticut	Dept. of Animal Diseases Storrs, Connecticut	NONE	NOT EXAMINED

Shipment of Specimens for Laboratory Diagnosis

The careful poultryman makes wise use of the diagnostic facilities offered but will not abuse them. Two to ten representative specimens should be submitted to the home-state laboratory soon after the start of a disease outbreak. Specimens should be shipped alive by express prepaid if the poultryman cannot deliver them in person.

The accompanying letter of transmittal should contain the following data: name and address; number, age and breed of all birds on the premises and of birds in affected houses; number of birds sick and dead from suspected disease; symptoms and lesions observed in the field; treatment applied; and other points of interest. It takes from three to

seven days to obtain a report by mail. Avoid shipping birds so as to arrive on a week-end or holiday. If it is necessary to send dead birds, make certain they are thoroughly cooled before packing.

Disease

What is meant by the term "disease"? Disease is any alteration from the normal which impairs the function of any part of the body.

Difference Between Contagious and Infectious Diseases

A contagious disease is one that is caused by disease-producing agents, such as bacteria, protozoa, viruses and parasites that have successfully invaded the body and multiplied there to the point of causing a disease condition. Such disease-producing agents are then spread to other animals, if they are close by, and they become sick with a contagious disease, because they acquired it through contact with the animal that first contracted the trouble.

Some examples of contagious diseases are fowl pox, laryngotracheitis, pullorum, tuberculosis and fowl typhoid.

A true infectious disease is caused by a disease-producing agent as are contagious diseases, but the agent does not spread from animal to animal where they are in contact with one another. The infection stays in the affected animal. There are a very few truly infectious diseases that are not also contagious. Some examples of truly infectious diseases are abscesses, common diarrhea, navel ill and possibly epidemic tremors.

All contagious diseases are infectious but all infectious diseases are not contagious.

It is unfortunate that the two terms are used more or less indiscriminately. Often-times a disease is named infectious when truly it is contagious, as in the case of infectious laryngotracheitis and infectious bronchitis. These two diseases are certainly contagious and, therefore, are infectious too.

Agents Which Cause Disease

1. Those agents that cause injury to the body structures. An injury is scientifically called a traumatism.
2. Bacteria are one of the chief agents which cause disease of poultry. They are so small that it takes a high-powered microscope to see them. They produce disease by giving off from themselves poisonous substances which, when absorbed by the animal, render the animal incapable of functioning in a normal manner. Pullorum is a disease caused by bacteria.
3. Protozoa are single-celled animals, microscopic in size, which cause damage to tissue inside the animal. An example of a protozoan disease is coccidiosis.
4. Virus is an infectious agent that is so small that it cannot be seen by means of the microscope. It will pass through filters that will not permit the passage of bacteria. These, also, do damage to the body tissues. An example of a virus disease is infectious laryngotracheitis.
5. Animal parasites such as lice, mites and worms infest the body and cause disease in various ways.

6. Vegetable parasites, such as fungi, molds, rusts and smuts are known to produce disease. Of these, molds are the only ones known to do damage to poultry. Brooder pneumonia (aspergillosis) is an example of a mold disease.
7. Poisons from animal, vegetable or mineral origin are sometimes dangerous. Rose chafers (rose bugs), poisonous plants in certain localities, and too much common salt or baking soda are examples of these agents.
8. Lack of fresh air, as is experienced sometimes from carbon monoxide poisoning due to faulty brooder stove adjustments.
9. Lack of necessary vitamins, as in case of rickets.
10. Lack of necessary minerals or mineral balance as is found in heavy incidence of slipped tendon (perosis).

DISEASES OF CHICKS

Blackhead

CAUSE: Blackhead is a protozoan disease caused by *histomonas meleagridis*.

SYMPTOMS: The head does not turn black as the name implies, but a greenish-yellow diarrhea is present. The affected chick appears dopey; loses appetite and moves about very slowly. A post mortem examination reveals a very characteristic swollen ceca (blind guts) filled with a cheesy-like material. In advanced cases, the liver shows depressions varying in size and which may be somewhat yellow in color.

CONTROL: Dispose of all chicks showing symptoms. To the remainder, give an Epsom salts flush. (See Coccidiosis Control—Pages 169 and 170). Keep pens and runs dry at all times. Keep chicks away from turkeys and turkey runs.

Brooder Pneumonia (Aspergillosis)

CAUSE: Brooder pneumonia is caused by a mold-like growth that infects the respiratory system—mainly the lungs and air sacs.

SYMPTOMS: Difficult breathing and yellowish spots or nodules found in the lungs and air sacs are symptoms of brooder pneumonia. These nodules should not be confused with those that are sometimes found in connection with pullorum disease.

CONTROL: This disease is not very prevalent. It may come from litter or other surroundings that have been allowed to become moldy. After disease has been definitely diagnosed by a competent person, the houses and utensils should be thoroughly cleaned and disinfected. Make sure the fresh litter and feed contain no mold.

Cannibalism

Toe-picking and feather-pulling are the forerunners of cannibalism in a flock of chicks. If not corrected, this vice is apt to continue during the life of the flock. Cannibalism is not a disease, but rather a vice which can be laid to faulty management in the brooder house. Crowding, lack of sufficient hopper space, and an uncomfortable environment due to excess heat are all contributing factors.

CONTROL: Treatment consists, first, in correcting the faulty management practices just mentioned. Chicks showing blood on their toes or on the tail stub should be immediately removed from the flock. Treatment for such chicks consists of washing the affected parts with warm disinfectant solution and then smearing these parts with carbolated vaseline.

Chick Bronchitis

CAUSE: Chick bronchitis is caused by a virus that affects the respiratory tract of chicks, mainly the trachea and bronchi.

SYMPTOMS: In chick bronchitis there is a decided gasping for breath in baby chicks. It may appear soon after hatching. The nasal passage, trachea and bronchi show the presence of mucous in varying amounts. Sometimes this mucous is slightly blood tinged. The lungs may be puffed as a result of the presence of froth. Mortality is likely to be very high.

CONTROL: There is not much that can be done in the way of control. The disease will run its course quickly. Those that recover should be isolated from following hatches in order not to infect them. Chlorine powder blown from a dust gun into the air above the birds after they have gone to roost at night tends to relieve the accumulation of mucous in the affected air passages and offers some relief to the birds. Dusting is preferable to spraying as the presence of moisture is undesirable.

Coccidiosis

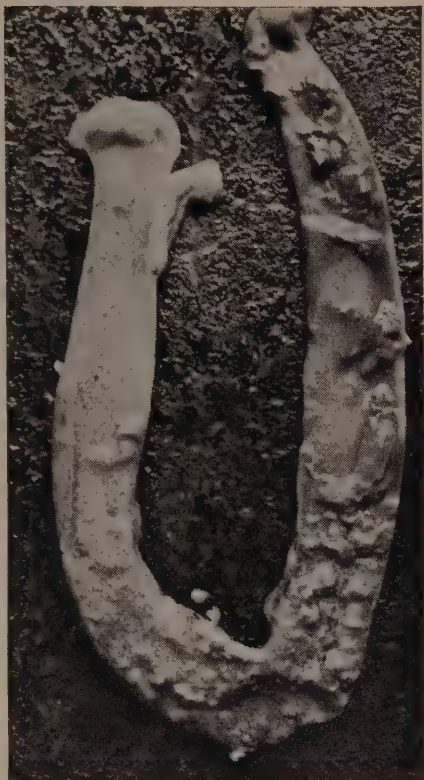
Coccidiosis is caused by a protozoan type of organism known as coccidia. There are six different species that affect chicks. These are one-celled animals which multiply in the lining of the intestine and may cause tremendous damage to it. During the multiplying stage some of these organisms are passed from the intestine with the droppings. At that time they are called oocysts and are not capable of causing coccidiosis but instead must remain a day or two in a warm, moist place in order to become infective when again taken into the digestive systems of previously uninfected birds.

There are two main types of coccidiosis, the acute and the chronic.

SYMPTOMS OF THE ACUTE TYPE OF COCCIDIOSIS. The acute type is most likely to occur when chicks are four to eight weeks of age. The characteristic symptoms consist of bloody droppings and blood or cheesy-like material in the ceca (blind guts), together with a very ruffled and pale appearance of the chick itself.

SYMPTOMS OF THE CHRONIC TYPE OF COCCIDIOSIS. The chronic type may occur at any time, usually at some time after the acute period has passed. It differs greatly from the acute form in that there are no bloody droppings. Chicks may appear to be ruffled, pale, and lose flesh. A post mortem examination shows the intestine other than the ceca to be infected. The part of the intestine next to the gizzard for some distance back may, in some cases, show small pin-point red spots or hemorrhages in the outside wall. In other cases, these spots will be white. Still other chicks will present an intestine that has become thickened,

with quantities of mucous present, and many times this mucous material has become thickened and bloody, and appears like a coating over the inside surface of the intestine.



Showing thickened mucous material present in some cases of chronic coccidiosis. Note at curved end the significant pinpoint hemorrhages associated with most cases of chronic coccidiosis.

he should wash his footgear in disinfectant when leaving the adult birds.

Deep litter helps a great deal in the control of coccidiosis, provided it is stirred frequently to keep it from caking. This stirring will also tend to keep the litter drier and to cover up the fresh droppings. It is thought that if the oocysts are mixed with old litter in this manner, they will be acted upon by putrefactive bacteria found there and become less harmful. Once a condition of coccidiosis, either acute or chronic, has been definitely diagnosed, give an immediate flushing with Epsom salts, followed by the use of additional milk in the ration or by the use of Wirthmore Poultry Flush, according to the following directions:

First, take away all feed for a 24-hour period. Also take away all water for a period of about two hours in order to let the chicks get thirsty. Then, give one pound of Epsom salts for every 500 pounds weight of chicks.

CONTROL: The outstanding control measure for coccidiosis, whether it be the acute or chronic type, is to maintain chicks under dry conditions at all times. As already stated, coccidia when passed in the droppings reach the infective stage in warm, moist surroundings. If this favorable condition is not available, there will be fewer infective organisms and, consequently, less infection spread to the chicks.

Poultrymen are less likely to have trouble from coccidiosis in their early hatched chicks than they are in those hatched later. The early ones are brooded under dry but cold outside conditions, consequently coccidia do not get a favorable chance to multiply. Later in the spring the outside temperature rises and there is more humidity present in the air.

Chicks should be raised entirely separate from adult birds. If possible, the same person should not care for both because of the danger of tracking infection from the old birds which may be carriers of the disease, to the young chicks. If it is necessary that both lots be managed by the same person, then

disinfectant when leaving the adult

**APPROXIMATE AMOUNT OF EPSOM SALTS TO USE
PER 300 CHICKS ACCORDING TO AGE**

<u>Age</u>	<u>Weight</u>	<u>Amount of Salts</u>	<u>Amount of Water</u>
1 week.	35 lbs..	2 tablespoonfuls or $\frac{3}{4}$ ounce	1 gallon
2 weeks.	75 "	5 tablespoonfuls or 2 ounces	1½ "
4 "	150 "	$\frac{1}{3}$ lb. or 1 cup	2 "
6 "	300 "	$\frac{2}{3}$ " " 2 cups	4 "
8 "	500 "	1 "	6 "
10 "	750 "	1½ "	8 "

Dissolve the necessary quantity of salts in the amount of water indicated, and distribute this solution throughout the drinking fountains. After this has been consumed, fill up the fountains with fresh water.

Follow the starvation period with an increased quantity of milk in the ration. This is most easily accomplished by using Wirthmore Poultry Flush for three or four days. Liquid milk is satisfactory if available and it may be used by replacing one-half the number of water fountains with milk receptacles which should be something other than metal. If it is necessary to purchase milk, get powdered milk and mix 15 to 18 pounds with 100 pounds of the regular mash, and feed for three to five days.

Some poultrymen prefer to use a flushing mash without first using Epsom salts, and in this case the use of Wirthmore Poultry Flush is recommended.

Simply take away all feed for 24 hours; then feed the flushing mash for three consecutive days.

A particular feature of Wirthmore Poultry Flush is that it contains dried whey which gives it those qualities of milk which are desirable, without increasing the protein content above that of the regular ration. High protein rations for sick chicks are not favored.

During the starvation period signs of picking or cannibalism should be watched for. Should picking start, feed Wirthmore Poultry Flush immediately instead of completing the 24-hour period of fasting.

Whichever method is used, the pens should be cleaned out and fresh litter replaced after the flushing action is completed. Chicks which show a drooping of the wings or loss of use of limbs should be removed and destroyed.

Crazy Chicks (Nutritional Encephalomalacia)

See Vitamin Deficiencies—Pages 182 and 183.

Epidemic Tremors (Trembling Chick Disease)

CAUSE: The cause of epidemic tremors is thought to be a filterable virus. It has been produced experimentally several times by inoculating the brain cavity of healthy chicks with brain material obtained from

infected chicks. This is one of the most baffling diseases to study. No one has been able to produce it by means of any change in management practices. It comes and it goes without any apparent reason.

SYMPTOMS: The outward symptoms are quite characteristic. Paralysis of the legs, wings or both, in chicks ranging in age from two to six weeks, is the first symptom. Sometimes this symptom is the only one noted, but in the majority of cases there are found later in the affected group several chicks that show a trembling of most any portion of the body but more particularly the head or tail, especially when the chick is excited. At first, it was thought that this trouble occurred more often in the first hatches, but since, it has been found in later hatches. In a few cases, it has appeared in more than one hatch but in the majority of cases the remaining hatches have not been affected.

A post mortem examination shows no characteristic lesions. A microscopic study of the brain tissue reveals changes which indicate the trouble. There is a gathering of abnormal cells which destroy or impair the function of the brain cells, resulting in a loss of control of the muscles in those parts of the chick's body that show trembling or paralysis.

Breeding experiments, in which affected cockerels have been bred to healthy pullets and vice versa, failed to produce chicks affected with this disease.

Some investigators think that this trouble will be added to the list that is included in the paralysis complex.

CONTROL: There is no known control measure. It appears to be non-contagious as far as its spread to healthy chicks is concerned.

All affected chicks should be slaughtered, because they will not recover. It is better to dispose of them at once and eliminate some expense. The remaining healthy-appearing chicks will be all right to use, as planned.

Indigestion

CAUSE: Indigestion is a term that is used to name a number of different conditions. It refers to a digestive disturbance which may be caused from filth organisms. Perhaps chilling or overheating may be the cause. In some cases the chicks may not have learned to eat the feed and, instead, eat the litter.

SYMPTOMS: The outstanding symptom is a "pasting-up" of the vent as a result of diarrhea — post mortem examination may show litter in the crop and gizzard. The liver may be yellowish in color. The gall bladder may be distended. The intestine may be void of solid feces and, instead, show only an inflamed condition with some mucous present.

CONTROL: For the first control measure, make sure the feeding methods are proper and that the temperature is correct. See that the surroundings and utensils are clean and that pure, clean water is provided. Give a flushing with Epsom salts and feed more milk or feed Wirthmore Poultry Flush as recommended under control of coccidiosis.

Navel Ill (Omphalitis)

Navel ill is caused by filth bacteria which gain admittance to the inside of the chick through the open navel and cause peritonitis. These organ-

isms come from the unsanitary conditions of the incubator, hatcher, or incubator cellar, and this indicates carelessness on the part of the hatcheryman.

In some cases, too high relative humidity at hatching time may cause the navel to remain open longer than it normally would under proper conditions and thus makes it possible for infectious organisms to enter over a longer period of time.

SYMPTOMS: This disease affects chicks during the first ten days after hatching. Sick chicks do not eat; the vent is pasted and chicks have a characteristic "pot-bellied" appearance. Sometimes the entire body tissues become swollen and shiny as though "water-logged". This type of trouble is known as "mushy chick disease". In other cases, the navel retains a scab for a period of time, and on the inside of the abdominal wall about the navel cord or yolk stalk, hemorrhages and perhaps pus pockets are formed. The unabsorbed egg yolk is large and often adhered to the surrounding tissue. Chicks which die from this disease have a characteristic pungent odor.

CONTROL: The control of navel ill may be satisfactorily accomplished by keeping the incubators, incubator cellar, and hatchers clean. To make the cleaning process more effective, fumigation is recommended after the equipment has been thoroughly cleaned. The directions for fumigation are as follows:

Fumigate when no chicks are hatching. For every 100 cubic feet of space, use three heaping tablespoonfuls of potassium permanganate crystals and seven tablespoonfuls of 40% formalin. Place the crystals in the receptacle first and pour the formalin onto them. Close up the compartment and leave for one hour at least. One fumigation may be sufficient, but it is better to repeat this procedure twice at three-day intervals.

Remember that under no conditions should these fumigants be used at this strength if chicks are present. If it is desired to fumigate while chickens are hatching, use the fumigant at the strength indicated under "Control"—"Paratyphoid", page 173.

Following the outbreak of this disease, there will be some chicks that survive that will not grow satisfactorily and should be destroyed.

✓ **Paratyphoid**

CAUSE: Paratyphoid is caused by bacteria similar to the organism responsible for pullorum disease. There are many kinds of bacteria found in connection with this disease in contrast to pullorum, which is caused by a specific organism.

SYMPTOMS: The symptoms of paratyphoid are very similar to those of pullorum. Mortality is likely to be high and occur during the first two weeks of the chick's life. The affected chicks do not eat, appear dopey, the vent becomes pasted and they soon die. A laboratory examination is necessary for a diagnosis.

CONTROL: When an outbreak occurs in chicks, they should be sold for broilers. The brooder houses and equipment should be thoroughly

cleaned and disinfected. Runs should be thoroughly cleaned, and covered with gravel. Since this disease may be transmitted through the egg, control measures may involve the parent stock. The breeding flock may be tested by means of the standard tube agglutination blood test, if the testing fluid (antigen) is made from the organisms of the disease recovered at the laboratory from the infected chicks. A standard antigen is not satisfactory because it may not contain the organism that is causing the trouble in that particular flock. Test every thirty days and remove reactors after each test. After they have passed a clean test, one may continue the breeding program. Fumigation of incubator, room and hatcher is necessary between hatches. Follow fumigation directions listed under Navel Ill, page 172. No chicks should be present.

It is recommended also that the hatches be fumigated when one-tenth to one-fifth of the chicks are hatched and again from 15 to 20 hours later. The strength of the fumigant for this purpose should be one heaping tablespoonful of potassium permanganate crystals with two and one-third tablespoonfuls of 40% formalin for every 100 cubic feet of space.

Sometimes the water or water systems become contaminated with this organism and so make it easy to spread the disease to the day-old chicks. Be sure to clean, and keep clean, all water containers and see that pure, fresh water is used.

Pneumonia

CAUSE: True pneumonia is due to exposure of some nature. Either the chicks are chilled, overheated, or subjected to a too great fluctuation in temperature. Although true pneumonia occurs during the brooding season, it should not be confused with brooder pneumonia as previously described. This disease is purely a management problem.

SYMPTOMS: When losses occur during the first two or three days of the chick's life, one may suspect the presence of pneumonia. Other chicks have pasted vents. Post mortem examination shows congested lungs as the outstanding symptom.

CONTROL: To control, change management practices so that the disease will not recur with the next hatch. To the survivors of the affected hatch give more milk in the mash. Fifteen to 20 pounds of powdered milk may be mixed with 100 pounds of regular mash and fed for three to seven days, or feed Wirthmore Poultry Flush for two to three days.

Poisoning

BAKING SODA: Overdoses of common baking soda may cause a severe poisoning and cause a high mortality, especially in baby chicks. All of the abdominal organs may be found to be covered with a whitish deposit resembling the deposits found in cases of gout in adults. The recommended dose is two tablespoonfuls to one gallon of drinking water for adults and one tablespoonful to one gallon of drinking water for chicks, this to be the drinking water for one day only. Some poultrymen

have assumed that if a little soda is good, a whole lot is better, but have later paid for this assumption through the unnecessary loss of chicks from baking soda poisoning.

METAL: The most common metal poisoning encountered in poultry is that which is produced from feeding milk in metal containers. The lactic acid of the milk reacts on the metal and causes the development of poisons. Milk should be fed in containers other than metal, such as wooden, earthenware or glass.

ROSE CHAFER: Rose chafers are brown insects that inhabit most any kind of foliage, during the month of June in most localities. They are very poisonous to chicks and may be found in the crops of chicks so poisoned on range.

CONTROL: Control may be accomplished either by housing the chicks or by preventing the chicks from coming in contact with the plants on the range that harbor these bugs. Sometimes the plants may be cut down and then the chafers will leave.

SALT: Salt poisoning is rare. Sometimes too much salt is accidentally mixed into the ration, and when consumed it causes the chick to drink quantities of water. It may drink so much that it may literally become water-logged and, subsequently, it dies. Sometimes there is a lack of water provided to meet the body demands when excessive salt is eaten and severe losses result.

Pullorum Disease

CAUSE: Pullorum disease is caused by a specific bacteria called salmonella pullorum. It may cause severe losses in baby chicks up to about ten days of age. It is not uncommon to experience losses amounting to well over 50% of the hatch. Infected breeding stock transmits this disease through the egg, and the chick is hatched already infected. In many places, infected eggs are hatched with non-infected eggs and the disease is spread at the time of hatching to the healthy chicks. The disease is also spread to healthy chicks when they come in contact with infected droppings.

SYMPTOMS: The main outward symptom of pullorum disease is a dopey attitude which soon results in heavy mortality in many cases. The vent may or may not be pasted. When this condition occurs between the third and tenth day of the chick's life, one may be suspicious of pullorum disease.

Post mortem examination often shows the egg yolk unabsorbed. The lungs are likely to be congested, and when yellow spots or nodules are seen in the lung tissue, it is almost conclusive evidence of this disease. A laboratory examination is necessary to definitely diagnose this trouble.

CONTROL: The keynote to the control of this disease is the testing of all birds on the farm by the standard tube agglutination blood test and this should be done by the recognized state laboratory. This test will identify the infected birds, after which they should be removed from the flock. By continued testing in this manner, clean flocks have been obtained for which official recognition is given. Once a flock has acquired a pullorum-free rating, it is tested once a year in order to continue

its official status. The official testing rules and regulations vary in different states, but the work is essentially the same. Today New England poultrymen enjoy the unique distinction of owning flocks that have greater freedom from pullorum disease than any section in the entire world. It is perfectly obvious that there is absolutely no excuse for any New England poultryman purchasing chicks infected with pullorum. Lists of the names of poultrymen whose flocks are clean may be procured from the state agency doing this testing.

A part of the U. S. Poultry Improvement Plan deals with the control of pullorum disease and it is unfortunate that recognition is given to



Ovary of adult bird infected with pullorum. Note mis-shapen and discolored yolks as compared to normal yolk pictured on page 201.

flocks that are blood tested but still have reactors present in the flock. This stock is advertised as "blood tested" and the innocent buyer thinks that these chicks are as good as the pullorum-clean stock of New England. After an outbreak of pullorum occurs in chicks, those that survive should never be used for breeders. They may be sold as broilers or kept for the production of market eggs. Purchase new stock from pullorum-clean sources and raise separately from the infected flock. Dispose of the infected flock at least one month before housing the clean flock and thoroughly clean and disinfect the laying house.

Since there is also considerable blood testing of turkeys for the detection of pullorum,

it seems wise to state here that the rapid whole blood agglutination test is of no value, but the standard tube agglutination test, as employed in routine pullorum testing in a one to 25 dilution is satisfactory to identify the infected birds.

Rickets

(See Vitamin Deficiencies—Pages 180 and 181.)

Slipped Tendon (Perosis)

CAUSE: Slipped tendon or perosis is caused by a lack of manganese or an improper balance between calcium and phosphorus, or both. There are other contributing causes such as crowding, overheating and the use of wire floors. Certain strains of birds are more susceptible than others and will not be 100% free of this trouble even under the best of feeding and management conditions.

SYMPTOMS: The main symptom of this disease is a characteristic deformity of the hock joint. The tendon that plays over the joint normally slips to one side and causes the leg from the hock joint downward to swing outward. The joint itself appears enlarged and thicker than natural.

CONTROL: Control of this condition is best effected by prevention. Wirthmore Feeds maintain the necessary calcium and phosphorus balance and manganese content in so far as it is possible to do so. The contributing factors are matters of management, as mentioned under "Symptoms", and may be easily corrected.

Sour Crop (Thrush)

CAUSE: Sour crop (thrush) is caused by a yeast-like mold (monilia) and should be distinguished from a sour crop due to a fermentative process.

SYMPTOMS: The symptom of this particular type of sour crop is the presence in the lining of the crop of grayish spots or nodules which sometimes spread over a sufficient area to appear as a membrane.

TREATMENT: Same as recommendations for control of brooder pneumonia. In addition, give copper sulfate as recommended under Ulcerated Gizzard Condition.

✓ Ulcerated Gizzard Condition (Erosion)

CAUSE: The cause of ulcerated gizzard condition is not definitely known at the time this book goes to press. This disease is one of the newer ones and was first noticed in chicks of about four weeks of age. Later it was found in day-old chicks and in the unhatched embryo. A recent survey shows that many chicks are hatched with this trouble and grow as well as one would expect any normal chicks to grow, provided they are not subjected to resistance-lowering conditions, such as being shipped great



Chick affected with ulcerated gizzard.

distances. The survey also showed that the chicks that hatch first in a given hatch do not show as many ulcers of the gizzard as do those that hatch late. Chicks subject to this condition reveal the trouble even when hatched in different incubators at different places, thus indicating that it is not an incubator difficulty.

Since lesions are found in newly-hatched chicks, suspicion is directed toward the parent stock. At the time this book goes to press, it is not definitely known whether the trouble with the breeders is nutritional, managerial, or a breeding factor.

Some investigators think that a gizzard erosion factor, when lacking in feeds, is responsible for this disease. All good poultry rations do contain these factors, but in spite of this fact, cases of ulcerated gizzard continue to appear in the field.

Other investigators show that there is an absence of cholic acid in the gizzard and when this is supplied, ulcers are prevented. Bile normally contains cholic acid, but in this disease there is a distention of the gall bladder and the bile does not get into the digestive system as it does in a normal chick.

SYMPTOMS: When gizzard erosions are seriously affecting chicks, the most noticeable symptom is the unevenness of growth. Some chicks may be four weeks of age or more, yet do not look to be more than

one week old except for the growth of the wing feathers which gives them a so-called "wingy" appearance.

Post mortem inspection shows ulcers of the gizzard lining. These ulcers may appear as brown or slightly reddish depressions. They may be very small or they may cover considerable of the lining area. The lining about the area is dead. It may be easily pulled away from the muscle underneath and sometimes the ulcers penetrate this muscle. In many cases, there is a decided enlargement of the ceca.

CONTROL: In advanced cases or cases of four or more weeks' duration, there is not much to do in the way of control except to destroy those that are affected. To subsequent lots, however, it is advised that copper sulfate be given as soon as they are hatched and continued for a period of about two weeks.



Left: Ceca from bird affected with ulcerated gizzard.
Right: Ceca from normal bird.

The treatment should be given as follows:

Dissolve one-half pound of copper sulfate crystals (blue vitriol) in one gallon of water.

Of this solution, give one and one-half ounces (three tablespoonfuls) to a gallon of water and use as drinking water throughout the day, every other day. The crystals may best be dissolved by placing them in a burlap sack or cloth and suspending it in the water near the top.



Arrow points to severe gizzard ulcer.

Whenever a few cases of ulcerated gizzard appear in the flock of chicks, give the above treatment immediately.

There is no experimental evidence to show that this treatment is specific but from field observations, it appears to be very helpful. It is thought that the copper sulfate offers nothing of a nutritional nature, but instead helps to heal the ulcers, thereby aiding the chick to regain its health.

VITAMIN DEFICIENCIES

Vitamins, like proteins, minerals or other well-known feed elements are necessary for normal growth. Part of the value of each cereal or animal product commonly used for poultry feeding is due to its content of one or more of the vitamins. The chief value of certain feedstuffs, such as milk products or alfalfa meal, is to supply important vitamins. Valued wholly because of their vitamin content are vitamin A and D oils or similar materials.

Although any vitamin, compared to other feed nutrients, is needed only in a minute amount, failure to supply enough of it results in an abnormal condition. An extreme shortage usually ends in a disorder which is called a deficiency disease. Less extreme shortages may not produce easily identified symptoms of a specific deficiency disease but generally lead to slower growth and inefficient use of feed.

Every practical poultry ration contains in some amount each vitamin known to be needed by chickens. Only certain vitamins require careful consideration when compounding a ration for chickens because of the abundance of most of the essential ones in the ingredients customarily used for poultry feeds. Vitamin D is of first importance since chickens cannot secure the amount needed for out-of-season and confinement rearing unless a vitamin D oil or similarly potent material is included in their ration. Next in importance for young chickens is the vitamin G

complex. This complex includes riboflavin, the anti-dermatosis factor and a third factor necessary for growth. To supply the quantity needed for normal development and maximum feed economy, requires sufficient use of milk products, liver meal, yeast, alfalfa, distillery by-products or other ingredients rich in vitamin G. Through care in choosing common ingredients and by using proper proportions a chick ration will ordinarily provide an abundance of all other vitamins known to be required, which are vitamins A, B₁ (thiamin), B₄, B₆, E and K. Certain vitamins, however, are not stable, so both ingredients and mixed feeds contain widely varying amounts of these vital substances. Therefore, care must be taken in selecting and storing ingredients, in compounding rations, and in handling feed to assure an adequate supply. High temperatures, age, exposure to light and rancidity are destroyers of certain vitamins; hence ingredients and mixed rations should be handled in such a way as to lessen ill effects from these influences. Poor brooder management, and disease such as coccidiosis, moreover, impair the ability of chicks to use effectively vitamins liberally present in good rations. These conditions, therefore, at times lead to the appearance of vitamin deficiency diseases under practical conditions. Those most commonly met with are vitamin D, A and G deficiencies. Possibly to be included among vitamin deficiency diseases is crazy chick disease.

VITAMIN DEFICIENCIES OF CHICKS

Vitamin A Deficiency (Nutritional Roup) (Xerophthalmia)

SYMPTOMS: A deficiency of vitamin A prevents chicks from growing at a normal rate. Affected chicks may show a staggering gait before other external symptoms appear. Listlessness is also often characteristic of this deficiency, yet when such chicks are disturbed, they may act unduly excitable. One of the early symptoms is an increased discharge of fluid from the eyes. This secretion may take the form of foam in the eye. Becoming sticky, it may glue the eyelids shut. As the disease progresses, the discharge may appear milky and gather as whitish, cheesy-like matter in the eye. Along with the eye symptoms a discharge from the nostrils may be noted, which in chronic cases may be followed by its accumulation within the sinuses, and a swelling of the face. Of importance in early diagnosis is the appearance of flaky, white deposits or thickened mucous within the vent. Other early symptoms are raised, yellowish-white spots in the mouth. These spots may also form in the gullet and the crop. Examination of the kidneys usually reveals an excess of urates, which make them appear pale and mark their surfaces with a network of fine, white lines. The ducts through which the kidneys discharge are frequently white because they are filled with urates. Urates may be deposited also as a chalk-like substance within the abdominal cavity. When the deficiency is severe, death may occur quickly after the first symptoms are seen. The peak of mortality, however, takes place from seven to 14 days after the appearance of external symptoms.

CONTROL: Vitamin A deficiency is easily prevented by the use of a chick starting ration which contains usual amounts of selected yellow corn, alfalfa and fish liver oil which are exceedingly rich in vitamin A.

Corn gluten meal and dried liver meal are also good sources of this factor. Although the vitamin A potency of ingredients diminishes with age and exposure to heat, the requirements of growing chicks are abundantly provided for in Wirthmore starting rations through careful selection of ingredients with high initial potency and by the use of quantities which allow for the gradual loss of A.

To remedy vitamin A deficiency when it occurs, first give a ration of Wirthmore quality in composition and freshness. If symptoms are severe, individual chicks may be treated daily for a week with several drops of cod liver oil. To hasten recovery of a badly affected flock, one-half pint of cod liver oil, or one-fifth pint of fortified cod liver oil, may be either mixed into 50 pounds of chick cracked corn and freely fed with the starting mash for four or five days, or the same amount of oil may be mixed into 100 pounds of the starter and fed for the same length of time.

Vitamin D Deficiency (Rickets)

SYMPTOMS: When there is a lack of vitamin D in the ration there develops in the chick a condition known as rickets. The minerals are not deposited in the bones as they should be, consequently the chick's gait becomes shortened, and the legs appear stiff and the condition progresses to the point of total collapse in advanced cases. There is a loss of flesh and an appearance of general unthriftiness. The joints become enlarged, particularly those of the ribs and hocks. The rib joints become enlarged first and this condition is called "beaded ribs". Later, the hocks are affected. The bones bend like a green stick and do not break with a snap like normal bones should. In advanced cases the beak becomes soft and rubber-like to the touch. If the end of a drumstick is split lengthwise, there will be noted a lack of bone substance and instead a large amount of cartilage.

CONTROL: The control of rickets depends on the use of materials other than cereals, cereal by-products or usual protein concentrates in order to supply vitamin D. Economical supplies of vitamin D are found in fish oils and are also produced by the irradiation of certain substances. The ultra-violet rays of the sun will cause the production of vitamin D in the body, provided the chick comes in direct contact with these rays. Although a prolonged deficiency of vitamin D will result in rickets regardless of the calcium and phosphorus in the ration, these mineral elements are essential in certain amounts and ratio if growth and bone formation are to be normal. Occasionally rickets occurs because of improper mineral supply rather than from the lack of vitamin D. The best preventive of vitamin D deficiency is the feeding of a good ration which supplies the needed amounts of these factors. Supplementing with hard grain a starting ration that was not designed to be fed with supplements, dilutes the amount of vitamin D, upsets the mineral balance and may cause rickets.

When evidence of vitamin D deficiency is observed, a chick ration containing adequate amounts of this vitamin and normally provided with calcium and phosphorus should be fed. Giving the chicks access to direct sunlight hastens recovery. During winter months when sunlight is less effective, chicks severely affected with rickets will be benefited by more

liberal provisions of vitamin D than are present in normal rations. Additional cod liver oil may be used in such cases as directed for vitamin A deficiency.

Vitamin G Deficiency

The vitamin G complex contains three factors known to be required by chickens. These are riboflavin, pantothenic acid, and a recently identified third growth factor. Riboflavin is frequently referred to as vitamin G or lactoflavin. Pantothenic acid is that part of the G complex called the filtrate or anti-dermatosis factor. The third factor is also termed the Cornell growth and reproduction factor, and factor U by California investigators. Natural sources of riboflavin are ordinarily satisfactory sources of the other two factors, but rations amply supplied with pantothenic acid may be deficient in the other two vitamins.

Riboflavin Deficiency

SYMPTOMS: A lack of riboflavin causes chicks to grow at a subnormal rate. Marked deficiencies may result in a paralysis of the toes and legs



Chick suffering from riboflavin deficiency.

due to degeneration of the sciatic nerve. This paralysis causes the toes to curl inward and when severe, the chick walks on its hocks. If the nerve is not severely affected, recovery from this paralysis may occur without change of ration. Curling of the toes due to flavin deficiency should not be confused with the development of "crooked toes", a disorder of unknown cause more commonly observed among brooder chicks. When toes curl as a result of riboflavin deficiency, it appears as if the chick was attempting to clutch something

as does a bird on a roost. In a case of crooked toes, one or more toes on either or both feet may be distinctly bent sideways at the joints.

CONTROL: Feeding a properly compounded chick ration will prevent riboflavin deficiency. When it occurs the use of such a feed will overcome symptoms and permit the chicks to regain their normal growth rate. Extreme cases respond more rapidly if a flavin-rich supplement is also fed for a short period. Either liquid milk may be given as a drink, or 10% of dried skimmed milk or dried whey can be added to the regular ration for seven to ten days. Young cereal grasses or leafy alfalfa hay may be freely provided. Because of its unpalatability, the addition of extra alfalfa meal is not advised. One part of Wirthmore Poultry Flush mixed with four parts of starting feed for a week will correct the deficiency.

Pantothenic Acid Deficiency (Chick Dermatitis)

SYMPTOMS: Rations lacking in pantothenic acid cause the development of skin disorders in young chickens. Early symptoms are granulations on the margins of the eyelids which may prevent the eye being opened wide, and may even cause it to remain shut. On the skin around the nostrils, the beak and the vent, crusty scabs may develop. In addition, the bottom of the feet and the skin between the toes may be affected; the outer skin thickens, hardens and sometimes cracks. The feathers generally lack luster and fail to lie smoothly.

Unfortunately, chickens sometimes develop similar eye and mouth symptoms that are not due to a deficiency of the anti-dermatitis factor. The two conditions are difficult to tell apart except through feeding. The false dermatitis will not be cured by rations rich in pantothenic acid. Likewise, battery-brooded chicks develop foot lesions that are mistaken for the deficiency symptoms. They, in turn, are not cured by the anti-dermatitis factor.

CONTROL: Since grains and their by-products contain effective amounts of pantothenic acid, chick rations reasonably supplied with the usual vitamin G supplements will prevent dermatitis. Some feeding grades of cane molasses are especially rich in pantothenic acid. Therefore, when chick dermatitis occurs, even though it is not known whether it is the true or false form, it should be treated. One recommended treatment is to feed molasses in the ration according to the following directions:

Mix two quarts of cane molasses with two quarts of warm water. Mix this diluted molasses with 25 pounds of bran. Mix this resultant mixture with 100 pounds of the regular ration. Feed for seven to ten days.

An alternate treatment is the use of milk or Wirthmore Poultry Flush as suggested for riboflavin deficiency on page 181.

Crazy Chick Disease (Nutritional Encephalomalacia)

CAUSE: The close similarity of the disease called nutritional encephalomalacia, which is produced by an experimental diet, and crazy chick disease, which at times occurs among chicks in the field fed natural rations, suggests a common cause. In fact, at the time this book goes to press, some authorities believe they are one and the same disease. Experimentally, the disease is prevented by the liberal use of certain vegetable oils and by synthetic vitamin E. Thus far it has not been shown that field outbreaks of crazy chick disease can be prevented by these substances. In fact, it is impractical to prepare chick rations with the quantity of vegetable oil found effective for control in the laboratory. The usual chick rations, moreover, are believed to contain sufficient vitamin E to meet requirements. Outbreaks of crazy chick disease, however, suggest that in certain years grain crops may lack some principle which in part determines the appearance of the trouble. Factors which promote rancidity in the ration are also suspected as contributory to its occurrence.

SYMPTOMS: An early symptom of crazy chick disease is a weaving walk. The affected chick may either pitch forward or backward. When lying on its side, the legs extend, move convulsively, and the chick often thrashes in a circle on one spot. The head may be drawn backward upon the neck

or to one side. Quivering is frequently detected. The symptoms appear suddenly, progress rapidly in most cases and usually end in death within a few hours or a few days. Crazy chick disease occurs when chickens are from two to seven weeks old, but most outbreaks are noted between three and four weeks of age. Fading of shank color usually precedes or accompanies the disturbance.

Correct diagnosis requires examination of the brain. Degenerated, softened areas and hemorrhages may be seen in the small brain in many cases. Microscopic examination usually reveals brain injury when it is not apparent to the unaided eye.

During the last 15 years outbreaks have been at times widespread and general in their occurrence, irrespective of breed or strain of chick, kind of ration fed, or time of year.

CONTROL: Until more is known regarding conditions which cause crazy chick disease, specific preventive or control measures cannot be developed. Control, therefore, is based upon past experience. A chick starting ration containing a variety of cereal products rather than one composed largely of any single cereal is recommended. Chick rations should not be stored in warm places, nor should old feeds be used, in order to lessen the development of rancidity. When symptoms appear, taking all feed away for a few hours each day for several days appears helpful. An Epsom salts flush is suggested. Wirthmore Poultry Flush fed for one day as the entire ration and thereafter for a week as one-fifth of the total ration, not only often prevents additional acute cases, but rapidly causes the pigment to reappear and brings improvement in flock health.

DISEASES OF ADULTS

(Colibacillosis)

"Blue Comb" — (Contagious Indigestion, Pullet Disease, New Disease)

The disease herein called "blue comb" is one which has many names. Until it is definitely decided what the name shall be, we plan to use the caption of "blue comb". The greater number of poultrymen probably know the condition by this name. From the standpoint of the symptoms of the disease, and the way it behaves, the name of contagious indigestion is much more fitting.

CAUSE: The cause of "blue comb" is not known, but some investigators have isolated a particular type of organism which may be responsible for it. The authorities believe that this disease is not a feed problem.

SYMPTOMS: "Blue comb" is very likely to affect pullets about two weeks after they are housed. In many cases it spreads from pen to pen as would a highly contagious disease. Birds which are in good condition and laying, die suddenly. Their combs appear rather blue or purple in

color and there is likely to be a greenish discharge from the vent. Sometimes older laying birds are affected and sometimes it affects pullets on range before they come into production.



Showing sour, full contents of crop of bird suffering from "blue comb".

An autopsy shows the crop to be full and very sour, and, in many cases, lined with a false membrane which is white in color. The gizzard is full and often green in color due to the backing up of bile from the place where it empties into the intestines. The intestine is enlarged and somewhat pale in appearance. The inside of the intestine presents contents that are very slimy in character, sometimes green in color, but often the color is grayish-brown. This slimy material may continue throughout the entire intestine. In case of laying birds, there is likely to be egg yolk material in the abdominal cavity, and yolks

of the egg cluster appear very much inflamed. The symptoms are typical of a severe condition of indigestion from one end of the digestive tract to the other.



Showing slimy condition inside the intestine of bird affected with "blue comb".

TREATMENT: The treatment of "blue comb" seems to be rather effective as noted from field observations. It is recommended that the affected flock first be given an Epsom salts flush. (See treatment of Chronic Coccidiosis, page 185).

The second part of the treatment consists in giving copper sulfate (blue vitriol) in the drinking water. Dissolve one-half pound of copper sulfate crystals in one gallon of water. This may best be dissolved by placing the crystals in a cloth sack and suspending it near the top of the water. Of this solution, give one and one-half ounces (three tablespoonfuls) to a gallon of water and use as drinking water for the day, every other day until the condition clears. If birds do not drink the copper sulfate water well, make a wet mash, using this water, and feed four or five times each day. Put copper sulfate in drinking water too, as recommended above.

Cholera

CAUSE: Fowl cholera is caused by bacteria of the septicemia group and are bipolar in shape. This disease is not troublesome in New England.

SYMPTOMS: In acute cases, the first noted symptom of fowl cholera is the death of a number of birds. A laboratory examination is necessary in order to diagnose the trouble. An autopsy examination may show small pin-point hemorrhages about the heart and throughout the muscles of the body to a varying degree. Sometimes the fat of the abdomen shows these hemorrhages.

CONTROL: The best control measure is the slaughter of the entire flock, followed by a thorough mechanical cleaning and disinfection of the premises. Two months later birds may be moved onto the plant with a reasonable degree of safety.

Chronic Coccidiosis

For cause and symptoms see: Chronic Coccidiosis under Coccidiosis of Chicks, pages 168 and 169.

CONTROL: Chronic coccidiosis of adults is often confused with true paralysis. A laboratory examination will differentiate between the two. The control of chronic coccidiosis may be best accomplished by the maintenance of deep, dry litter in the pens. When the birds appear to be growing progressively lighter in weight, remove them and use or sell for meat purposes. To the remainder of the flock, give an Epsom salts flush as follows:

Take all drink away from the birds at midday for a period of two hours or so, in order that the birds may become thirsty. For every 500 pounds weight of birds, give one pound of salts. Dissolve the salts in the amount of water the birds will drink in one-half day and distribute throughout the water fountains. After the salt solution has been consumed, refill the fountains with fresh water.

If given in this manner, the salts will act during the night and thus not contaminate the range, or litter in the laying house, whichever the case may be. Following the Epsom salts treatment, it is helpful to add additional quantities of milk to the ration, or to use Wirthmore Poultry Flush, for one week. Whenever the flock shows indications of this trouble, this treatment should be repeated.

Coryza (Infectious Cold)

CAUSE: The form of coryza with which we are most concerned is probably caused by bacteria. There are some forms that seem to harbor a particular form of infectious agent that resembles a virus.

SYMPTOMS: Coryza is more likely to affect birds soon after they are housed and nicely started in production. It may appear at any time, and particularly during the fall and winter months. The affected birds appear dopey, do not eat and slump badly in production. There is usually a

swelling about the eyes and a rather copious discharge from the nostrils which may have an offensive odor. In some cases there develops, due to



Showing closed, swollen eye common to coryza.

secondary organisms, a cheesy-like material or an exudate about the swollen eye which may be opened and this material removed. This same cheesy-like material may, in advanced cases, be found about the mouth and throat. This latter condition used to be called "roup". Coryza may last for several weeks or it may last for only two or three. It spreads readily from pen to pen. A laboratory should diagnose this condition in order to differentiate it from infectious laryngotracheitis and contagious bronchitis.

CONTROL: There is no direct treatment for coryza. The condition will run its course faster if the birds are kept comfortable and fed any-

thing wholesome which they will eat. Literally stuff them with wet mash, any form of milk and pellets, in addition to regular feed. It is thought that cod liver oil placed in the drinking water is helpful and also the feeding of more yellow corn. Chlorine powder may be used as indicated under "Chick Bronchitis" on page 168.

To prevent recurrence the next year, raise the pullets on range and away from the laying stock that had the disease. At least one month or so before the pullets should be housed, sell the old flock that may have carriers or spreaders of the disease in it, clean and disinfect the pens, and let them lie idle during the summer months before the pullets are housed. In some cases it would be impossible to dispose of the older birds, or perhaps the above-mentioned procedure would not be practical for some other reason. In these instances, the procedure outlined below is followed by some poultrymen:

An attempt is made to inoculate the pullets on range during the summer when the weather is good. Some growing cockerels are placed in the pens with the older birds that have recovered from the disease. Carriers spread the disease to these cockerels, after which they are placed back on range with the growing pullets. In this way the pullets are inoculated.

It must be noted, however, that if this plan is followed there is little or no hope of eradicating the disease, and the procedure must be repeated with each new lot of chicks.

Some investigators claim that no immunity is produced after an attack of coryza, but several field observations seem to indicate otherwise. The experience of some poultrymen leads them to believe it is sound practice to try to immunize their growing stock in the above manner. They believe it is less harmful to do this and may be the means of saving them some money.

Favus

CAUSE: Favus is caused by fungus that grows on the unfeathered portions of the head and spreads to other portions of the body. It is quite contagious.

SYMPTOM: The symptom of favus is an unusually white appearance of the head. Usually a very few birds are found affected at one time and seldom is it serious. This disease should not be confused with the white appearance of the comb and wattle due to their normal shrinkage when the bird has stopped production. If in doubt, consult your poultry pathologist, a Wirthmore Poultry Service representative or other competent authority.

CONTROL: The control of favus is simple. Remove all affected birds and keep them isolated. Paint the affected parts with tincture of iodine and glycerin mixed half and half.

Fowl Paralysis Complex

Fowl paralysis complex includes a group of related conditions such as true fowl or range paralysis, leukemia (leukosis) or big liver disease, and tumors.

In the year prior to publication of this book there was established a federal laboratory at East Lansing, Michigan, for the purpose of studying this complex. We are looking to this laboratory for help in combating this trouble.

Fowl Paralysis

SYMPTOMS: Symptoms of true fowl paralysis may be any or a combination of the following:

- Unsteady gait.
- Drooping wing or wings.
- Paralysis of one or both legs.
- Twisted neck.
- Gray or pearly eyes.

An autopsy will show the nerves of either the legs or wings or both to be enlarged and this is the main symptom.

Leukemia (Leukosis — Big Liver Disease)

SYMPTOMS: In the case of leukemia, the birds have a sleepy and very pale appearance. Diarrhea is usually present and birds may die rather suddenly.



Left: Sciatic nerve from normal bird.
Right: Sciatic nerve from bird affected with fowl paralysis.

An autopsy shows that the liver is enlarged in most instances, sometimes huge and gray in color. The spleen, kidneys and heart also may be enlarged.

Tumors



Arrow points to tumor of abdominal cavity.



Interesting view of a rare bone tumor of head.

Tumors include all abnormal growths that may occur at any place about the body of the bird. They are most often found in the abdominal cavity and may be attached to almost any organ in this cavity, particularly the ovary, intestines and kidneys.

Control of Conditions of the Fowl Paralysis Complex

Diseases of this group are chronic in nature and, therefore, it takes time for their presence to become manifest. It is easy to confuse this condition with chronic coccidiosis, so a laboratory diagnosis is necessary. There is not much that we know that can be done in the way of control outside of the following suggestions:

The poultryman should be slow to introduce new stock without first subjecting it to his own farm conditions in a trial manner. The fact that stock is purchased from a source where paralysis is little or no problem is no guarantee that the trouble may not appear when this stock is introduced to other farm conditions. Carrying two or more strains of birds on a given farm at the same time seems to aggravate the fowl paralysis complex.

If the poultryman breeds from stock that is one or more years of age and free from this disease, the stock has demonstrated its ability to live and so should produce chicks that will live better than those coming from flocks with high mortality.

Some of these diseases are spread by agents which introduce it into the blood stream. It is highly important, then, that lice, mites, flies, mosquitoes, etc., be controlled to the fullest possible degree because they may be responsible for transferring the causative agent from an infected to a non-infected bird.

Fowl Pox

CAUSE: Fowl pox is caused by a virus.

SYMPTOMS: Symptoms of fowl pox occur in the form of scabs about the unfeathered portion of the head. These scabs at first are yellow, raised areas with water underneath like blisters. They break and a brown scab appears. These may be single or there may be many so close together that there appears to be one large scab covering the affected areas. Sometimes they appear on the eyelid and close the eye, causing the eye to discharge fluid.



Head of cockerel showing typical scabs on the head and wattles.

CONTROL: Fowl pox is very easily controlled. It is one of the very few diseases for which there is a definite control measure. Vaccination with fowl pox vaccine should be practiced by all poultrymen when there is the slightest possibility of their birds contracting this disease. It is cheap insurance and affords protection against a possible total egg loss in the middle of the production period. One natural outbreak will cost many times the expense involved in many years of vaccination.

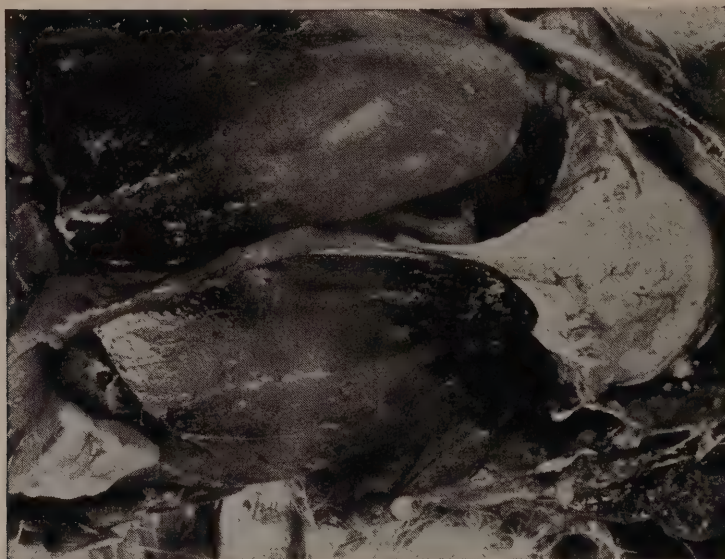
Vaccination should be done while the birds are on range in the summer when the weather is favorable and before the birds come into production.

If the poultryman has not vaccinated and an outbreak of fowl pox occurs in the laying house, he may proceed to vaccinate the unaffected pens by the use of regular fowl pox vaccine or pigeon pox vaccine, but a drop in production and a molt may be experienced. Birds seriously affected with fowl pox may be treated with tincture of iodine applied directly to the scabs. Try to maintain feed consumption during the outbreak.

Gout

CAUSE: Gout is caused by faulty digestion in birds that are unable to eliminate the toxic products of protein digestion.

SYMPTOMS: A bird affected with gout may appear unthrifty and soon dies. An autopsy shows white deposits over the heart, liver, spleen or intestines. This white material is composed of urates which are the poisonous waste products of protein digestion already mentioned.



Liver and heart showing white deposits of urates. Note the heart completely surrounded by urates.

This disease does not manifest itself much. Usually a few birds in a flock may be affected, but no great damage is experienced from this trouble.

Differentiating Symptoms of Coryza, Infectious Bronchitis, Infectious Laryngotracheitis

CORYZA — Slight, if any mortality. Swollen eyes that discharge in many cases. Discharge from nostrils that may have a pungent odor. Coughing and sneezing.

INFECTIOUS BRONCHITIS — Slight, if any mortality. The typical outward symptom is that of a rattling noise when the bird breathes. Autopsy examination will reveal some plain mucous in the trachea, and the lungs enlarged with froth.

INFECTIOUS LARYNGOTRACHEITIS — Heavy and rapid mortality. There is a decided gasping for breath. Bloody mucous may be coughed up and spread about the pens. The trachea (windpipe) is more or less filled with bloody mucous.

Infectious Bronchitis

CAUSE: Infectious bronchitis is caused by a virus that affects the trachea and bronchi of birds.

SYMPTOMS: The affected birds are dozey, do not eat, and slump in production. There is a characteristic gasping for breath accompanied by a rattling noise. The trachea is inflamed and may show the presence of mucous. Sometimes there is cheesy-like material near the entrance of the trachea. A mucous plug at the lower end of the windpipe where it divides into the two bronchi is probably responsible for the rattle. The lungs show a puffed appearance as a result of the presence of froth in the air sacs. Very few birds die. It may last for a few weeks or in more favorable cases, disappear much quicker.

CONTROL: The control measures as listed for the control of coryza (see page 186) may also apply to this disease. It requires a laboratory examination to diagnose this disease and to differentiate it from coryza and infectious laryngotracheitis. It is well to remember, too, that recovered birds may be carriers of infectious bronchitis and are capable of infecting healthy birds even though they themselves show no symptoms.

Infectious Laryngotracheitis

CAUSE: Infectious laryngotracheitis is caused by a virus that affects primarily the larynx and trachea of birds.

SYMPTOMS: Infectious laryngotracheitis is likely to strike suddenly.

A number of dead birds may be the first symptom noted. Others will show a decided gasping for breath and some may be coughing and throwing bloody mucous about the pens. A real acute outbreak presents a very high and rapid mortality. If control measures are not started at once, 50% of the flock may die.

An autopsy will reveal the trouble to be mostly in the larynx and trachea. In typical cases, the trachea contains much bloody mucous. When the windpipe, or trachea, becomes too full, it does not allow the passage of the proper amount of air, hence the bird suffocates.

CONTROL: Infectious laryngotracheitis is one other disease for which there is a definite control and like fowl pox, may be prevented by vaccination. The vaccine for the prevention of this disease is rather expensive as com-



Trachea "A" shows bloody mucous material. Trachea "B" shows a more pronounced case in that the mucous material has coagulated to form a cheesy-like core.

pared to fowl pox vaccine. In general, it is better not to vaccinate until there has appeared a natural outbreak of the disease in the flock. A laboratory examination is necessary for a diagnosis. Any suspicious symptoms should be a signal for quick action. If the disease is diagnosed early, the unaffected part of the flock should be vaccinated at once. No time should be wasted. By so doing, immunity will be produced in a majority of cases before the disease has killed too many birds. Laying birds vaccinated with infectious laryngotracheitis vaccine will drop but little in production.

Once an outbreak occurs, it is usually necessary to continue vaccination of the pullets each year. This should be done when the pullets are on range and during the summer months when the weather is favorable. In some instances it may seem feasible to get rid of vaccination. This may be accomplished in two ways. The growing pullets may be raised separately from the adult stock and before housing them, the old stock may be sold, the pens cleaned, disinfected and allowed to lie idle for at least a month during the summer and before the young stock is housed. The other method is to be used in cases where the older birds cannot be sold. It consists of examining the growing pullets for "takes" three to four days following their vaccination. Those that show no "takes" are revaccinated by inoculating their cloaca again with the discharge from the cloaca of a bird that shows a "take". If the revaccinated birds still do not show a "take", dispose of them by slaughtering for meat consumption. All the birds left have been artificially immunized and these birds will have no carriers or spreaders of the disease, whereas a bird that becomes infected naturally and recovers may be a carrier. By practicing this procedure year after year, all birds on the premises will eventually be artificially immunized with no carriers, and when that time comes, one may stop vaccinating. In some states a permit is required before vaccinating for infectious laryngotracheitis.

Leukemia

(See Fowl Paralysis Complex—Pages 187-189).

Lice

It is easy to find lice upon the body of the bird if they are present. They are more prevalent about the vent.

TREATMENT: The treatment for lice that is probably most commonly used and which is quite effective is nicotine sulfate compound. An oil can or paint brush may be used to spread a small amount of this material along the top of each roosting rail a few minutes before the birds go to roost. The body heat of the birds will cause fumes to rise from this nicotine material and kill the lice.

Mites

Every poultryman is acquainted with these tiny creatures which are sure to appear wherever poultry is kept in small numbers as well as in large flocks. No one knows how or from where they arrive in poultry buildings,

but one thing is sure, they will arrive. They hide during daylight in cracks and crevices, on the underside of roosts, nests and dropping boards, and in the litter. At night they crawl up on the birds and suck blood through the skin, irritating the bird and taking away from it some of the life blood. When it is realized that each bird may be harboring and feeding hundreds of these tiny creatures every night, there can be no question as to their harmful effect.

When gorged with blood, the mites are distinctly red in color, but at other times are very inconspicuous, appearing more like specks or bunches of gray dust.

CONTROL: Mites can be controlled and should not be a serious problem to poultrymen. Paint the walls for a distance of about three feet up from the floor with carbolineum or other coal-tar product. Roosts, supports and nests should be painted at least twice a year with the same material. Crank case oil, with the addition of one pint of crude carbolic acid to each five gallons of oil, may also be used for this purpose. Be sure to do the painting only after laying houses are thoroughly cleaned and before the pullets are housed.

When mites are discovered while birds are in the laying pen, painting the roosts and nests with a coal-tar product is not recommended. This material takes several days to dry, the birds on the roosts will get their feet and shanks covered with it, and it is an irritant. In the nests the odor from such coal-tar products is absorbed by the eggs, making them unfit for use.

To keep mites under control in pens occupied by laying birds, a mild spray can be used. One such spray is made by adding one pint of crude carbolic acid to five gallons of kerosene oil. Use this spray monthly until the house is empty and can be painted with carbolineum or other coal-tar product.

Depluming Mites

Depluming mites burrow into the skin near the base of the feathers.

CONTROL: To control depluming mites, paint roosts with a nicotine sulfate compound. In severe cases, nicotine sulfate compound may be lightly applied with a small brush directly to the badly affected parts which, as a rule, are the top of the head and the under side of the wing.

Scaly Leg Mites

These mites cause the formation of scabs on the legs.

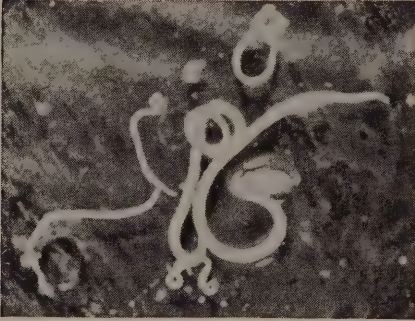
CONTROL: Scaly leg mites may be controlled by softening the scabs with soap and water and dipping the affected parts in kerosene oil.

Pullorum Disease

(See Pullorum Disease of Chicks, Pages 174 and 175).

Roundworms

There are many kinds of roundworms but the one with which we are most concerned is the large roundworm. These worms take food away from the host, give off poisonous substances or damage the wall of the intestines. Under favorable conditions, the eggs which pass with the feces will contain in a few days an infective form of the worm. When these eggs are taken into the digestive system with some feed, they hatch and the bird is infested with roundworms.



Roundworms.

CONTROL: No worm treatment is too effective. One should conclude that when his flock has worms, he should give the birds feed enough to

feed the worms too. Often-times roundworms do not cause too much damage. Perhaps a bird or two dies each week because of parasites. If the flock is in heavy production, it is probably better to sacrifice a bird now and then, than it is to give the flock worm treatment and take a chance on losing the egg production as a result. Whether treatment is necessary or not, should depend upon the advice of the poultry pathologist, the Wirthmore Poultry Service representative or some other experienced person. Tetrathlorethylene capsules, various preparations of nicotine, or iodine vermicide are some of the drugs used for the direct treatment of roundworms.

Ruptured Egg Yolk Condition

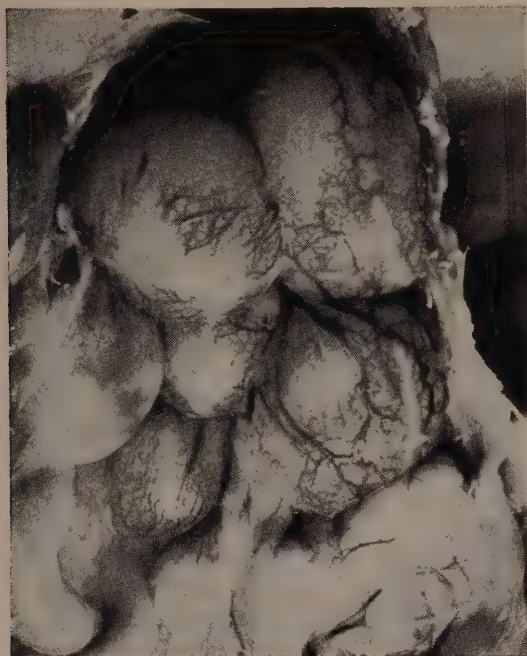


Oviduct and flattened, mis-shapen yolk as seen in ruptured egg yolk condition.

CAUSE: There are many things that cause ruptured egg yolk condition. Several cases occur after handling the birds; for example, after housing the birds from the range, or handling during blood testing or vaccination. It is believed in some localities that it is associated with fowl cholera, typhoid or pullorum disease, but in New England these causes are not considered because these diseases are not prevalent.

Anything that may frighten the birds is likely to cause ruptured yolks. Sometimes the nests or perches are placed too high or in such a manner

that access to them is not easy. From field observations it seems possible that many cases of "blue comb" may cause ruptured egg yolks.



Engorgement of blood vessels of the membrane around remaining yolks associated with ruptured egg yolk condition.

SYMPTOMS: The outward symptoms of ruptured egg yolk condition are those of a dead bird with a purple comb, and a bird in good flesh, of course; otherwise she would not be laying eggs. An autopsy reveals egg-yolk material in the abdominal cavity. It may be fresh or it may appear much like scrambled egg in consistency depending upon the length of time the material has been there. Sometimes a fully developed egg is found free in the abdominal cavity. Practically all cases show peritonitis, which manifests itself by a severe congestion of the blood vessels about the intestines, and the ova of the egg cluster.

CONTROL: Whenever cases of ruptured egg yolk occur, have them examined by the poultry pathologist for the possible presence of other

disease conditions, particularly "blue comb". Be sure that management practices are what they should be in regard to the care of laying birds as suggested under possible causes.

Tapeworms

Tapeworms are ribbon shaped and are segmented. Some are large enough to be seen with the naked eye, while others are better seen with the aid of a microscope. In order for tapeworms to infect birds, it is necessary that the birds eat some form of animal life such as flies, slugs, beetles, etc., which have the infective form of tapeworms. Eggs from tapeworms pass out with the feces of birds that are infested. These eggs have to be taken into the body of the intermediate hosts, and these hosts eaten by the bird in order to infest other birds.

CONTROL: No direct tapeworm treatment is satisfactory because it is very difficult to remove the head of the worm which is quite firmly attached to the inside lining of the intestines. Kamala has been recommended for years. It is impossible to standardize this drug, consequently the dosage is difficult to determine. It is safer to use this drug by trying it on a few birds, one-gram capsule or tablet to a bird. If none of them die as the result of this, then one may feel safe in dosing the rest of the flock the same way. Iodine vermicide has been recommended in view of

favorable results obtained. Before giving any worm medicine consult the poultry pathologist, a Wirthmore Poultry Service representative or other competent authority to make sure that such treatment is necessary.

Tuberculosis

CAUSE: Tuberculosis is caused by bacteria, which may affect any organ or part of the body.

SYMPTOMS: Tuberculosis may be first noticed by the unthrifty appearance of the affected flock. There may be an occasional loss. An autopsy reveals yellow bunches or nodules about the abdominal organs, particularly the intestines and liver.

CONTROL: Fortunately there is very little tuberculosis of poultry in New England. Birds are not as a rule kept over a year or two and since this is a chronic disease and takes time to develop, the birds are slaughtered before they have a chance to infect the pullet flock. In New England, too, birds are more confined and thus they do not come in contact with other animals that might have the disease and which might spread it to them.

A laboratory examination is necessary to diagnose this trouble. Birds in an infected flock may be tested with tuberculin to determine which ones are infected and these removed for slaughter. This method is not practical, however, and probably the best method is to sell all birds for slaughter, clean up the premises, disinfect, and replace with healthy stock.

Typhoid

CAUSE: Fowl typhoid is caused by bacteria.

SYMPTOMS: Fowl typhoid causes rapid and high mortality. An autopsy shows a characteristic greenish color of the liver.

CONTROL: The diagnosis of this disease requires a laboratory examination. In New England this disease is not much of a problem. It is very fortunate that birds affected with fowl typhoid will react to the pullorum test. Consequently when reactors to the pullorum test are removed, the typhoid-infected birds are removed, too. In cases where outbreaks occur, the whole flock should be sold, the premises cleaned, disinfected, and allowed to lie idle for a month or more during the summer, before healthy stock is added.

Tumors

(See Fowl Paralysis Complex, Pages 187-189).

Vitamin Deficiencies

(See Pages 178 and 179).

MISCELLANEOUS DISEASES

Cannibalism

Cannibalism is a vice. There seems to be no reason for the birds to pick each other. It is thought that in many cases they get the habit from picking at the exposed cloaca during the act of laying an egg in those cases where sufficient darkness is not provided for the laying nests. Excessive feeding of scratch grain aggravates the trouble. The use of Wirthmore Complete Egg Ration or Wirthmore Complete Laying Ration reduces the occurrence of cannibalism. Housing the birds before they come into 10% production so that they become accustomed to the nests and do not lay on the floor is also helpful. When birds are left on range, suitable nests should be provided. Lack of sufficient nesting and feeding space aggravates the trouble. Feeding a small quantity of oats in the hoppers or in the litter is a helpful practice.

This condition has been overcome in some instances by keeping the birds eating something during the middle part of the day when they are most likely not to be too busy. The suspension of cabbages or other such materials from the ceiling of the pens to a point where the birds may pick at them has been successful. Trimming the beak is a temporary relief. As a last resort, mechanical devices applied to the beak will definitely stop this trouble.

Eggs With Off-Flavor or Fishy Odors

Eggs with fishy odor may be produced by certain birds which have an inherited ability to transmit off-flavor to the eggs. When this condition is particularly troublesome, a thorough culling of all birds that show signs of going out of condition may be helpful.

Other cases of off-flavor eggs are the result of faulty storage prior to marketing. Eggs will absorb odors readily, so it is essential that they be kept where no unfavorable odors are present.

Meat and Blood Spots

Some fresh eggs show meat and blood spots. Blood spots are due to pinpoint hemorrhages of the ovary or oviduct during the process of laying. Meat spots are a sloughing off, and subsequent inclusion in the albumen, of worn-out or dead tissue from the interior walls of the oviduct. A well-balanced ration such as Wirthmore helps to keep this trouble down to a minimum. Neither meat nor blood spots can be eliminated entirely during the period of heavy laying. When meat and blood spots persist in being abnormally troublesome, inheritance should be considered.

Soft-Shelled Eggs

Soft-shelled eggs occur mostly at start of production. It is thought that the glands that have to do with the manufacture of the shell are not sufficiently developed to make a normal shell. Lack of oyster shells or

limestone grit may contribute to this condition in some instances. Wirthmore Feeds, when correctly fed with proper shell-making materials such as high grade oyster shells or calcite grit, supply all materials that are needed to prevent the occurrence of soft-shelled eggs from a nutritional cause. Under extended, heavy production, birds will sometimes neglect to eat enough oyster shells or calcite grit to take care of their heavy requirements. In such cases hand feeding on top of the mash of these shell-making materials will aid in correcting the trouble. Soft, thin or porous-shelled eggs are often an aftermath of respiratory outbreaks in the laying flock.

Prolapsus

CAUSE: Prolapsus is caused by excessive straining of the bird while in the act of laying an egg. The oviduct is not sufficiently developed to accommodate such a large egg. It is possible that the bird has been bred for production of large eggs and the oviduct has not increased in size accordingly.

SYMPTOM: The symptom of the condition of prolapsus is a protrusion from the vent of a part of the oviduct. The organ becomes so stretched that the part near the vent turns inside out to a varying degree, depending upon the severity of the strain.

CONTROL: Prolapsus may lead to cannibalism if affected birds are not removed immediately from the pen. The protrusion is very red due to congestion with blood, and birds like to pick at such objects. It is usually best to slaughter affected birds and use them for meat consumption. If treatment is thought advisable, keep bird isolated from other birds, push back the protruding portion by gentle pressure with the fingers and apply carbolated vaseline to the area, inserting it into the oviduct as far as the fingers will reach.

Vent Gleet

CAUSE: The cause of vent gleet is not definitely known. No organism has been found responsible for this condition. It is thought that digestive disturbances of the sort that produce diarrhea may be responsible. The droppings are very fluid and some of them become adhered to the feathers about the vent. There it decomposes and dries onto the feathers and skin and causes a severe irritation which results in ulcers of the skin about the area.

SYMPTOMS: The symptoms of so-called vent gleet are a vent that is smeared with dried, decomposing droppings next to the skin, and this covered with fresher moist droppings on the outside. There is present a very pungent odor.

CONTROL: Vent gleet is not considered to be serious. A few birds in a flock may show symptoms of it and so should be thought of as just incidental. If too many cases are present, it is a good idea to check on housing conditions to make sure of proper ventilation. It may be that the feed is a bit too laxative or that Epsom salts has been given too

often. Worms or other intestinal parasites may cause an excessive diarrhea condition. "Blue comb" may also be a factor.

Some authorities have looked upon vent gleet as a venereal disease but since no causative agent has been found and since it does not spread to healthy birds to any degree, it apparently should not be considered as a contagious disease.

As a direct treatment, isolate all affected birds; pull all feathers about the vent that have droppings on them. Remove the dead tissue and apply carbolated vaseline daily over the affected area.

In the presentation of this section of the seventh edition of "Timely Topics" we are duly thankful for the help rendered by Dr. Carl L. Martin of the New Hampshire Agricultural Experiment Station, Durham, New Hampshire, head of the Poultry Pathology Laboratory in that institution. Photographs are by Dr. C. A. Bottorff of the New Hampshire Poultry Pathology Laboratory.



Setting feed hoppers on a low wire-covered platform placed at the front of the brooding quarters is an excellent chick-management practice.



LEFT

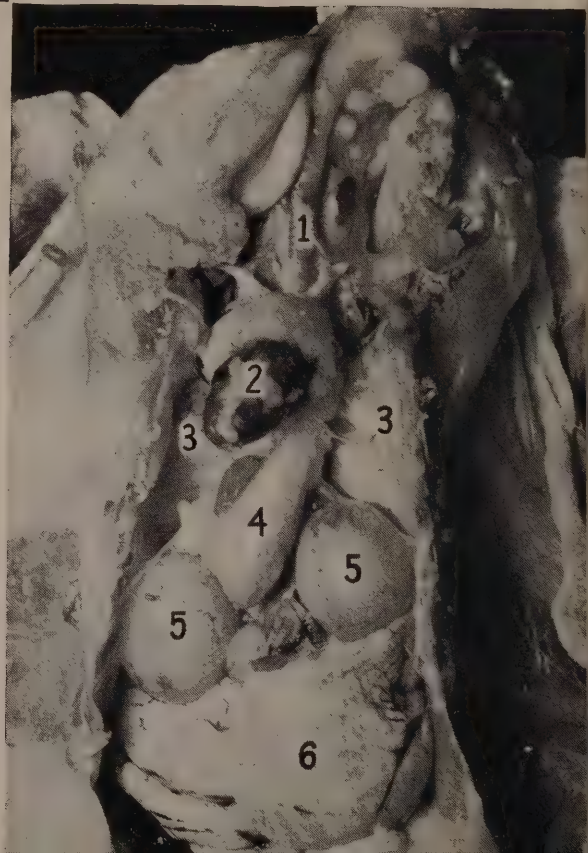
- A. Abdominal organs of normal laying bird with breast-bone and abdominal wall removed.

1. Esophagus
2. Trachea
3. Crop
4. Heart
5. Lung
6. Liver
7. Gizzard
8. Intestine
9. Cloaca
10. Wing
11. Leg

RIGHT

- C. Abdominal organs of normal laying bird with gizzard, spleen, liver and intestines removed.

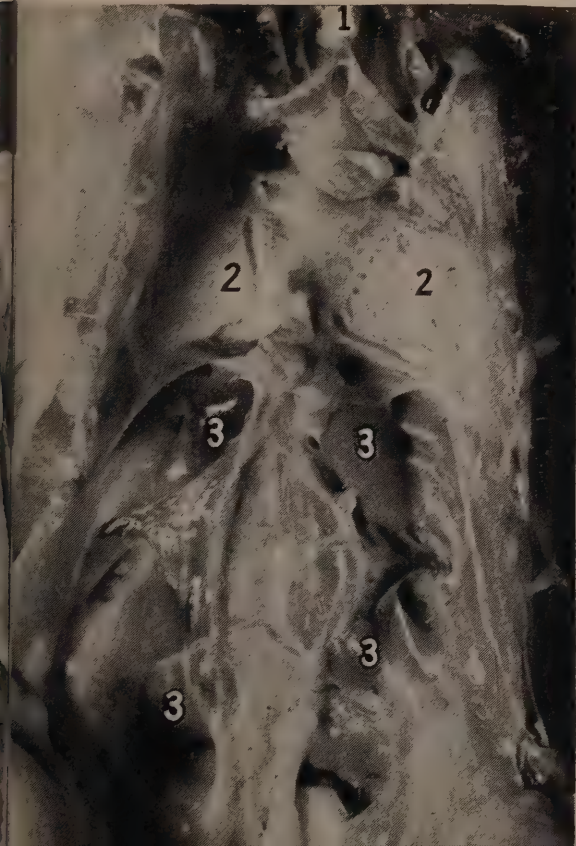
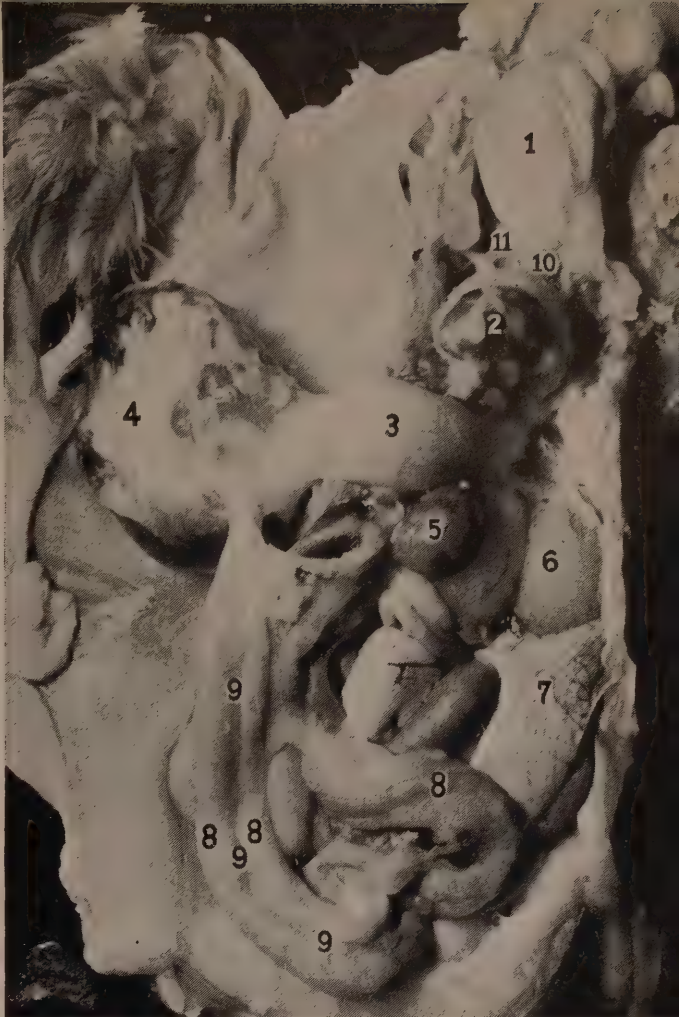
1. Trachea
2. Heart
3. Lung
4. Proventriculus
(glandular stomach)
5. Ova
6. Oviduct



RIGHT

B. Abdominal organs of normal laying bird — gizzard pulled to one side — liver removed.

1. Crop
2. Heart
3. Proventriculus
(glandular stomach)
4. Gizzard
5. Spleen
6. Yolk
7. Oviduct
8. Intestine
9. Pancreas
(enveloped by intestinal loop)
10. Trachea
11. Esophagus



LEFT

D. Abdominal organs of normal bird removed except lungs, trachea and kidneys.

1. Trachea
2. Lung
3. Kidney (shown in recesses of backbone)



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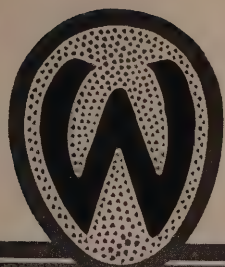
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OUR THANKS

In presenting this seventh edition of "Timely Topics", we wish to express our sincere thanks to all who have cooperated by contributing directly or indirectly to the text and illustrative material which it contains.

Special thanks go to various college and extension staffs both within and outside of New England, numerous manufacturers of poultry equipment, several of New England's larger hatcheries, and many of New England's poultry breeders, as well as operators of commercial egg and poultry meat plants.

It is a source of regret that space would not permit us to reproduce more of the many excellent photographs submitted to us.

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